Electric Vehicles Today!

May 2005 **Electric Auto Association (EAA)**

"Promoting the use of electric vehicles since 1967"

Solectria Force

GM EV1

Toyota RAV4-EV

Chrysler Epic

Honda EV Plus

Nissan Altra

Corbin Sparrow

Why Electric Vehicles?

EVs (electric vehicles) produce zero tailpipe emissions and up to 99% lower emissions than gasoline and diesel vehicles. EVs help America reduce its dependence on oil.

POWERED BY AMERICAN ELECTRONS

Thousands of EVs are registered across the country. New battery technology gives full-function EVs ranges of 80-120 miles per charge traveling at highway speeds. An EV fits perfectly into multi-car households; the EV for everyday travel, and a hybrid or conventional car for extended trips. Studies have shown that 80% of commuters travel less than 40 miles per day. How about *you*? Could 100 mile range *and* convenient refueling at home meet *your* daily driving needs?

We know there is a market for EVs. Every EV produced is immediately sold or leased! EVs are high performance vehicles and priced competitively when measured against comparable gasoline-powered vehicles. In addition, fuel and maintenance expenses are significantly lower for EVs. And talk about lasting value, an electric drive motor provides as many as 1,000,000 miles of service. The initial purchase price for EVs will drop as production volume increases. Prices always go down as volume goes up - Henry Ford knew that long ago! In the meantime, EV owners enjoy the financial benefits of significantly lower fuel and maintenance expenses.

EVs are a clean, efficient alternative to conventional vehicles – using technology readily available today!

EVs, Hybrids, and Fuel Cell Vehicles

There are primarily three electric vehicle technologies in America today: electric vehicles (EV), hybrid gasoline/electric vehicles (Hybrid), and Fuel Cell vehicles.

EVs draw electricity from batteries to power an electric motor to propel the vehicle, generating zero emissions. Hybrid gas/electric vehicles use both a battery-powered electric motor and a conventional gasoline-powered engine for propulsion. Hybrids generate tailpipe emissions, but less than its gasoline counterpart. Fuel cell vehicles use an onboard fuel cell to generate electricity to power an electric motor to propel the vehicle. Fuel Cell vehicles are emissions free, but decades away from a commercial market.

EV technology is at the core of all three. But a big difference between EVs, Hybrids, and Fuel Cell vehicles is the method used to generate the electricity that powers them. The batteries in an EV are charged using standard household electricity and electricity captured by regenerative braking. An EV can be 'filled-up' at home. The battery in a Hybrid is charged internally by electricity generated by the gasoline engine and electricity captured by regenerative braking. A Hybrid can be 'filled-up' at the neighborhood gas station. The electricity that propels a Fuel Cell Vehicle is generated from the combustion of hydrogen in its onboard fuel cell. There is no infrastructure for dispensing hydrogen into vehicles; therefore, while this vehicle technology is promising, it is not yet practical.

About the EAA

The EAA is a non-profit educational organization that promotes the advancement and widespread adoption of electric vehicles; organizes public exhibits and events of electric vehicles to educate the public on the progress and benefits of electric vehicle technology.

"EAA EV drivers have logged over 5 million clean miles"

Ford Ranger

AC Propulsion tZero

Th!nk City

Commuter Cars Tango

GEM

Mike's E-Bike

Segway Scooter

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Rev: 20050516

Earth's Finite Resources

US oil production has been declining since 1970 (since 1998 in Alaska) and US imports have risen by 67% since 1970[1]. The Union of Concerned Scientists states the US (4% of the earth's population) consumes 25% of the world's total oil production[2]. Our demand grows daily. We *must* have alternatives!

Electric Vehicle Information

Why EVs?

EVs offer the best and cheapest alternative to petroleum-based transportation. Driving an EV helps improve the quality of life for all Americans. They are fun to drive. It is patriotic!

Can EVs go fast?

Yes! For real speed, check out the National Electric Drag Racing Association (nedra.com).

EVs just move the pollution, don't they?

No. Even including the effects of electricity generation, the California Air Resources Board reports that ***EVs are 90% cleaner than the newest (model year 2005) and cleanest conventional gasoline-powered car vehicles***[3] – not including the environmental impact of oil refining! EVs are a proven "clean and green" choice.

Are EVs practical?

Yes. Studies show that 80% of daily commuting is less than 40 miles. Internal combustion vehicles generate the greatest amount of pollution during the first 20 minutes of operation. EVs require no warm-up period and are the perfect transportation option.

Where do you "fill up" an EV?

EVs are primarily charged at home overnight, using surplus (low-cost) electricity. There are also many public charging locations (evchargernews.com).

Are EVs expensive to purchase?

Not when you consider the total lifetime costs[4]. As production volumes increase, EVs will cost no more than conventional cars and trucks in every price range. Many states and the federal government recognize this low-volume pricing issue and offer incentives to reduce the initial cost of buying or leasing an EV. Currently there are no EVs available from the major auto makers. Toyota's RAV4-EV stopped production in Nov 2002 when they sold their last one. Used EVs are sometimes available. Keep an eye on companies like Commuter Cars – they're taking orders today for a Tango.

Are EVs expensive to operate?

No. A Toyota RAV4-EV costs less than 3 cents/mile to operate. EVs are nearly maintenance free (no smog checks, oil changes, or tune-ups). At $2.00 per gallon, a gasoline-powered car must average 67 mpg to match this! And today's gas prices are higher than $2.00/gal!

Do batteries pollute landfills?

The Battery Council International reports that 93% of *all* battery lead is recycled. A higher recycling rate than newspapers (55%) or aluminum cans (42%). Typical new lead-acid batteries contain 60-80% recycled lead and plastic[5]. A true recycling success!

Electric Auto Association

[1] http://pubs.wri.org/pubs_content_text.cfm?ContentID=1219
[2] http://www.ucsusa.org/publication.cfm?publicationID=492
[3] http://www.arb.ca.gov/msprog/zevprog/factsheets/evsummary.pdf
[4] http://www.epri.com/corporate/discover_epri/news/downloads/EPRI_AdvBatEV.pdf
[5] http://www.batterycouncil.org/recycling.html

The Truth About Auto Emissions

May 2005 **Electric Auto Association (EAA)**

"Promoting the use of electric vehicles since 1967"

Every Day is a Spare the Air Day in an electric vehicle!

"Vehicle emissions pose a serious threat to public health." – American Lung Association

"EVs could yet prove to be the future of clean transportation." – Union of Concerned Scientists

"Even if EVs are recharged using fossil fuels, they can cut global warming emissions by as much as 70 percent." – Union of Concerned Scientists

What are emissions and why are they bad?

Components of air pollution include[1]: Carbon Monoxide (CO) – reduces the blood's ability to carry oxygen, aggravates lung and heart disease, and causes headaches, fatigue, and dizziness. Sulfur Dioxides (SOx) – when combined with water vapor in the air become the major contributor to acid rain. Nitrogen Oxides (NOx) – cause the yellowish-brown haze over dirty cities, and when combined with oxygen becomes a poisonous gas that can damage lung tissue. Hydrocarbons (HC) are a group of pollutants that react to form ozone (O_3), some HCs cause cancer and others can irritate mucous membranes. Ozone (O_3) is the white haze or smog seen over many cities. Ozone can irritate the respiratory system, decrease lung function, and aggravate chronic lung diseases (such as asthma). Carbon Dioxide (CO_2), although naturally occurring, can cause problems. In large quantities it allows more sunlight to enter the atmosphere than can escape – trapping excess heat that can lead to the "greenhouse effect" and cause global warming.

Ozone is a toxic gas, but it's not emitted directly from tailpipes. Ground-level ozone is formed by a chemical reaction between VOCs (volatile organic compounds) and NOx, released from fuel combustion, in the presence of sunlight. Ground-level ozone concentrations can reach unhealthful levels when the weather is hot and sunny with little or no wind[2]. Gasoline and diesel powered cars, trucks, and buses are the major sources of NOx and VOCs.

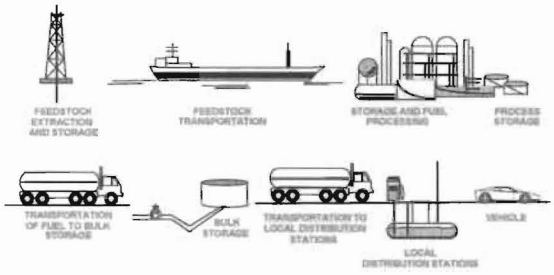
According to the American Lung Association[3], ozone is a serious threat to public health. Exposure to high levels of ozone causes significantly higher rates of asthma in children. In pregnant women, it can cause a significantly higher rate of babies with birth defects.

Where do the emissions come from?

Before comparing the emissions associated with vehicles and fuel types, consider the full fuel cycle. Emissions are generated at each step in this cycle—extraction of raw fuel (feedstock), transportation, storage, processing, and distribution to the vehicle itself, or "well-to-tank" emissions; emissions are also generated by the vehicle itself, "tank-to-wheels". The full cycle is referred to as "well-to-wheels".

Full Fuel Cycle...

Emission impacts of alternative fuels should be compared on a full fuel cycle basis



Vehicles are defined by the level of emissions (tank-to-wheels) they produce: low-emissions (LEV), ultra-low emissions (ULEV), super low-emissions (SULEV), partial zero emissions (PZEV), and zero emissions (ZEV). Basically, LEVs, ULEVs, SULEVs, and PZEVs produce lower vehicle emissions than vehicles built prior to 1972, but do little to reduce CO_2 emissions. PZEVs go a step further than SULEVs by eliminating emissions from the vaporization of fuel in the gas tank and fuel system. Lower emissions levels are achieved by control systems installed on these vehicles. However, these systems degrade over time, which reduces their effectiveness in controlling emissions. ZEVs, on the other hand, produce no emissions and so have no need for emissions systems!

[1] http://www.evadc.org/pwrplnt.pdf
[2] http://www.epa.gov/oar/oaqps/gooduphigh/
[3] http://www.californialung.org/spotlight/smog_02ss.html

"EAA EV drivers have logged over 5 million clean miles"

"Zero and near-zero emission vehicles are essential for achieving and maintaining clean air." – Union of Concerned Scientists

The US EPA estimates that 5 to 20 percent of the total U.S. population is especially susceptible to the harmful effects of ozone air pollution.

"Even if 10,000 EVs plugged in at the same time, they would only need 50 megawatts, less than 0.06% of California's total power demand." – California Air Resources Board

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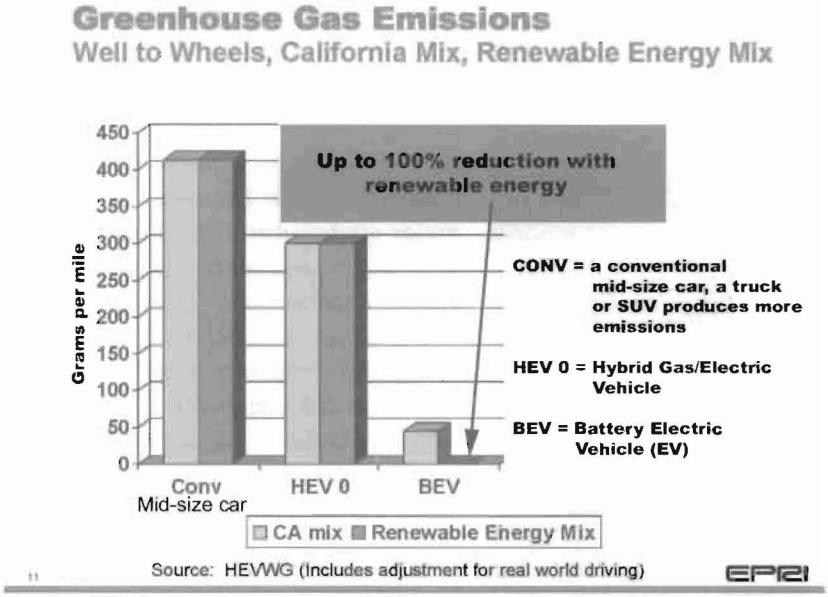
Electric vehicles (EVs) produce zero emissions from the vehicle itself – and are classified as ZEVs. The only emissions are those released during the generation of electricity (from coal, natural gas, etc.). However, even those emissions can be eliminated if the electricity is generated from renewable sources, such as solar or wind!

The "Greenhouse Gas Emissions" graph compares the overall emissions for vehicles available today. The graph clearly shows that EVs really do reduce emissions. And, switching to renewable sources for electricity generation can reduce **all** emissions associated with EVs.



According to the Union of Concerned Scientists, "**Despite decades of air pollution control efforts, at least 92 million Americans still live in areas with chronic smog problems.**"[4] "Americans are driving more miles each year, partially offsetting the environmental benefits of individual vehicle emissions reductions."[5] And the mix of vehicles on the road includes a greater number of higher emissions vehicles (trucks and SUVs), making the problem worse.

According to the California Air Resources Board (CARB), even when taking into account power plant emissions, ***EVs are 90% cleaner than the newest (model year 2005) and cleanest conventional gasoline-powered car vehicles***[6] (not including the environmental impact of oil refining). Emissions from central power plants are easier to control than emissions generated by millions of cars on the road. Future power plants will be more efficient and even cleaner. When they utilize renewable energy sources, such as wind and solar energy, the full "well-to-wheels" emissions for EVs will be zero! It is not possible to achieve zero "well-to-wheels" emissions for a vehicle that uses a gasoline or diesel engine.

Many EV drivers have not waited for central power plants to switch to renewable electricity generation. They have installed photovoltaic cells on their homes to generate clean electricity from the sun today! With EVs you actually have an option for fuel sources (for electric generation) – including renewable sources – with gasoline-powered vehicles there are no other options – only gasoline.

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[4] http://www.ucsusa.org/clean_vehicles/cars_and_suvs/page.cfm?pageID=231
[5] http://www.ucsusa.org/clean_vehicles/cars_and_suvs/page.cfm?pageID=247
[6] http://www.arb.ca.gov/msprog/zevprog/factsheets/evsummary.pdf

Convert to Electric Vehicles

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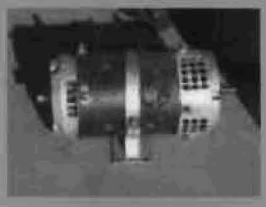
Electro Automotive VoltsRabbit

Acterra EV Conversion Project



DC Motor

Example components

Why Build an EV?

Today there are limited production electric vehicles (EVs) available, so converting an existing internal combustion engine (ICE) vehicle to an electric vehicle (EV) might be the best choice available to obtain an EV.

Building your own electric vehicle (EV) can be a rewarding and challenging experience. Not only will you be a pioneer in the EV movement, but you will also be recycling a car that may be headed for the junk yard. Don't wait for Detroit. Custom build an EV yourself[1].

A typical EV conversion will achieve a range of 30-60 miles for each charge. Studies have shown that 80% of commuters travel less than 40 miles per day, and 50% of commuters travel 20 miles (or less) per day. An EV conversion can meet those daily driving needs.

EVs are a clean, efficient alternative to conventional vehicles – using technology that is readily available today! EVs produce zero emissions, and when you consider the full fuel cycle to generate electricity, are up to 99% cleaner than gasoline and diesel vehicles. EV owners enjoy the financial benefits of significantly lower fuel and maintenance expenses. Finally, EVs help reduce our dependence on oil.

What steps are involved?

This overview provides a high level framework for performing a conversion. Please review the references and other links (in the next section) for more complete information.

1. Determine your driving needs: range – the distance you travel in a single day; type of vehicle – family car, commuter, utility vehicle, or racing car.
2. Look for an EV kit for the vehicle you choose. Kits will make the conversion significantly easier – they include all of the parts, except batteries. A conversion kit will cost about $4,000-$6,000, and the batteries, depending on how many you need, can cost another $700-$1,200.
3. Make sure you have access to the proper tools and supplies, and a place to do the conversion. You may need to rent equipment like engine hoists and contract out welding work. Contact EV veterans for advice and assistance.
4. Familiarize yourself with the EV components that will be installed. The most common batteries for EV conversions are lead-acid batteries, specifically, 12-volt sealed batteries.
5. Safety. Any project involving automobiles and tools has inherent risks. Be aware of these possible hazards to prevent damage to the vehicle and serious injury to you.
6. Remove the ICE components, making room for the EV components.
7. Install the motor, components, battery box, and batteries.
8. Install the wiring for propulsion (traction pack), auxiliary power system (12-volt system), and traction pack charging system, and displays and controls.
9. Safety testing. Test the battery charger; check the wiring and fuses, connections. Then take it out for a spin and notice the quiet, smooth ride. Be sure to show it off!

[1] http://www.evadc.org/build_an_ev.html. In addition, this excellent web site is the source for much of the information included here.

"EAA EV drivers have logged over 5 million clean miles"

"Your notes should be required reading for all members before starting construction." – Satisfied reader (posted on amazon.com)

"An exceptional book for anyone looking to get the initial know-how on how to convert a gas vehicle to an electric vehicle (EV)." – Satisfied reader (posted on amazon.com)

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More Resources and Links

- Seek out the nearest Electric Auto Association (EAA) chapter http://www.eaaev.org and attend a local meeting. The links page has information about conversions and components (http://eaaev.org/eaalinks.html)
- Electric Vehicle Association of Greater Washington DC has an excellent overview "Build an EV" at http://www.evadc.org/build_an_ev.html. Much of the material presented here comes from this web site.
- Probably the definitive book on conversions, "Convert It" by Michael Brown & Shari Prange (ISBN 1879857944), provides a step-by-step guide through the entire conversion process. From Electro Automotive http://www.electroauto.com.
- "Build Your Own Electric Vehicle" by Bob Brant (ISBN 0830642315), features in-depth descriptions of battery, motor, controller technology, with formulas, photos, and diagrams.
- "The New Electric Vehicles: A Clean and Quiet Revolution" by Michael Hackelman (ISBN 096295887). Features EVs including conversions, solar cars, electrathon racers, boats, and even planes. Includes color photos and helpful construction tips.
- DC Power Systems is a component supplier (http://www.dcpowersystems.com).
- AC Propulsion offers many EV technologies (http://www.acpropulsion.com).
- EV Parts, Inc is a component supplier (http://www.evparts.com/firstpage.php).
- Manzanita Micro EV components (http://www.manzanitamicro.com).
- Café Electric EV controllers (http://www.cafeelectric.com).
- KTA Services provides EV components and kits (http://www.kta-ev.com).
- http://www.metricmind.com/ , Victor Tikhonov imports Siemens AC drives.
- EV World has information about conversions, conversion supplier, and a list of popular EV conversion vehicles (http://www.evworld.com/archives/hobbyists.html).
- EV discussion group http://geocities.com/ev_list.
- Grassroots Electric Vehicle Company supplies EV components and has a video series on EV conversions at http://www.grassrootsev.com
- The Electric Drive Transportation Association http://www.electricdrive.org/index.php?tg=articles&topics=48&new=0&newc=0.
- An EV conversion diary http://www.evsupersite.net/pages/807953/index.htm.
- Acterra's EV conversion project http://www.acterra.org/ev.
- National Electric Drag Racing Association (http://www.nedra.com).

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Electric Auto Association

High Gas Prices Got You Down? Drive Electric!

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"US Government deficits lead to higher gas prices. Deficits lower US dollar value. World-wide oil prices are in US dollars; therefore oil producers raise price/barrel to counter the lower value of the US dollar." – 4/2/2004, "PBS's Now With Bill Moyers".

"U.S. gasoline demand will set a record in 2004." – US Energy Information Administration

Gasoline is refined from crude oil and primarily used to fuel automotives and light trucks[1]. You can avoid the cost and headache of rising gasoline prices by driving an electric vehicle (EV). An EV refuels at home. You simply plug it in, and let it charge while you sleep – using surplus (low-cost) electricity available at night (during non-peak hours).

Why is the Price of Gasoline Rising?

Today's California gasoline price (the highest in the nation), adjusted for inflation, is still lower than in 1981 – the price peak. Our price is a bargain compared to the price paid in the rest of the world (over $5/gallon in many countries)[4]. **It's estimated that if US government subsidies were removed, the price of gasoline in America would be between $5.60 and $15.14 per gallon[5].** Petroleum is a non-renewable resource. Enormous price increases are inevitable given that the demand for gasoline is rapidly outpacing the world supply.

California Historical Prices

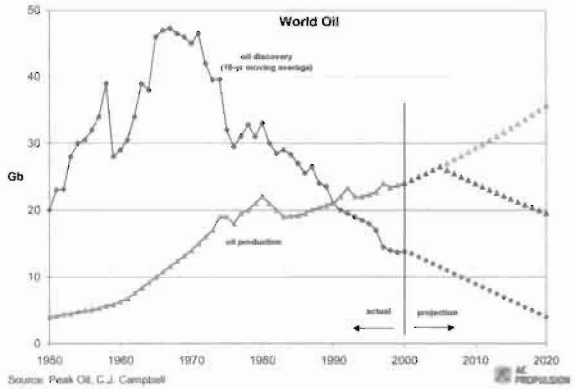
		Adjusted for Inflation	
	Gasoline[2]		Electricity[2] (peak rate)
Year	**$/gal**	**$/gal**	**$/kWh**
1970	$0.34	$1.32	(not available)
1981	**$1.34**	**$2.94**	$0.0569
1990	$1.09	$1.42	$0.1063
2005	**$2.79**	**$2.79**[3]	**$0.1238**

In contrast, the price for electricity has not drastically changed in the past 14 years. Electricity is generated locally, can be generated using renewable resources (solar, wind, biomass, geothermal), and is conveniently and safely delivered to our homes.

Finite Resources

With 4% of Earth's population, the US consumes 25% of the world's total oil production[6]. Oil production has been declining since 1970 while US imports have risen by 67% since 1970[7]. According to "Peak Oil: An Outlook on Crude Oil Depletion"[8]: 1) oil discovery peaked in the 1960s; 2) we now find 1 barrel of oil for every 4 we consume; 3) Middle East share of production is set to rise (short-term); 4) the rest of world production peaked in 1997, and is therefore in terminal decline. This decline of global petroleum is not a re-run of the oil shocks of the 1970s. This **decline in production is driven by resource constraints, not politics, and is a permanent (not temporary) condition**.

The Impending Decline of Global Petroleum



[1] US Dept of Energy, http://www.eia.doe.gov/pub/oil_gas/petroleum/analysis_publications/primer_on_gasoline_prices/html/petbro.html
[2] California Energy Commission, http://www.energy.ca.gov/electricity/rates_iou_vs_muni_nominal/residential.html
[3] Highest price listed on http://gaspricewatch.com, on 5/16/2004; average price listed was $2.10.
[4] http://money.cnn.com/pf/features/lists/global_gasprices/price.html
[5] http://www.icta.org/press/release.cfm?news_id=12
[6] http://www.ucsusa.org/publication.cfm?publicationID=492
[7] http://pubs.wri.org/pubs_content_text.cfm?ContentID=1219
[8] http://energycrisis.org/de/lecture.html

"EAA EV drivers have logged over 5 million clean and petroleum-free miles"

"'By 2015, we will need to find, develop and produce a volume of new oil and gas that is equal to eight out of every 10 barrels being produced today" - Jon Thompson, President Exxon Mobil

"The Federal government recognizes that the steady growth of imported oil, to meet US requirements, cannot continue..." Spencer Abraham, US Secretary of Energy (01/09/2002)

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How Far Does Your Money Go?

Since most of our oil is imported, your gasoline money goes pretty far - overseas, that is. Electricity is much cheaper than gasoline, and is generated locally. The energy equivalent of one gallon of gasoline is 33.53 kWh of electricity (GGE)[9]. However, 1 GGE of electricity in an EV takes you 110 miles. Over 2 times farther than an HEV, and 11 times farther than a full-size SUV. An EV simply takes your money farther. Let's use a conservative price for gas.

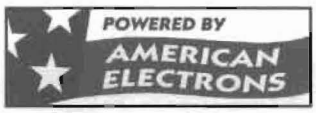
2004	$/GGE	Miles/GGE	$/mile	Miles/GGE Efficiency Relative to an EV
Full Size SUV	$2.00[10]	10	$0.200	**11X worse than EV**
Mid-Size SUV		17	$0.118	**6.5X worse than EV**
Mid-Size Sedan		22	$0.091	**5X worse than EV**
Compact Sedan		32	$0.063	**3.5X worse than EV**
Hybrid (HEV)		50	$0.040	**2.2X worse than EV**
EV (peak electricity)	$4.15	110	$0.038	**1**
EV (off-peak, $0.075/kWh)	**$2.66**	**110**	**$0.022**	**1**

What Can You Do?

Everyday choices make a difference. *Drive Less*. Use alternative forms of transportation, including public transportation, bike, walk, or telecommute. People are driving more than ever. The total Vehicle Miles Traveled (VMT) is increasing rapidly[11]. In California, VMT increased 93% from 1980 to 2000, while the population only increased by 37%; and VMT is projected to increase another 70% over the next 25 years.

Drive Different. Drive alternative-fuel vehicles, including vehicles powered by electricity, compressed natural gas (CNG)[12], and bio-diesel[13]. Take the Clean Car Pledge[14] that your next car will be the highest mileage and "greenest" possible.

Why EVs?



EVs offer the best and cheapest alternative to petroleum-based transportation. Driving EVs helps improve the quality of life for all Americans. But EVs are also needed for our energy independence and national security. EVs make use of technology that is readily available today to reduce our thirst for gas - we can't wait decades for potential alternatives, like fuel cell vehicles.

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[9] US Dept of Energy, http://www.afdc.doe.gov/p_single_faq.cgi?5
[10] Conservative (low) price for gasoline; lower than the May 16, 2005 average price of $2.10/gallon.
[11] http://www.transportationca.com/archives/CaliforniaStudy2001.htm
[12] For more information on CNG powered vehicles, see http://www.afdc.doe.gov/altfuel/natural_gas.html
[13] For more information on biodiesel powered vehicles, see http://www.afdc.doe.gov/altfuel/biodiesel.html
[14] http://www.cleancarcampaign.org/pledge.shtml

What is a plug-in car?

GM EV1

In an all-electric car, high performance batteries store cleaner, cheaper, domestic electricity, and an emission-free electric motor makes the car go. A conventional hybrid gets all its power from gasoline. A plug-in hybrid uses cheaper electricity for the first emission-free miles, and then gasoline to continue driving.

Honda EV+

Sounds great! Can I get one?

It's very difficult to find an electric car today. Carmakers should offer us the choice of electric cars and plug-in hybrids. The automakers produced great electric cars to meet California's Zero Emission Vehicle Mandate during the '90s. But only a small number of these electric cars were ever offered for sale. The auto and oil industries spent millions lobbying in Sacramento, sued in federal court and successfully eviscerated the Mandate, eliminating any real choice for consumers.

GM, Honda, Ford and Toyota confiscated and destroyed thousands of electric cars, despite offers of cash from satisfied customers. In 2005, as a result of the DontCrush.com campaign to save electric cars, Ford and Toyota agreed to stop crushing their great electric cars.

Plug In America and the Electric Auto Association are working for the electric choices we want now. But the automakers still only sell gas cars.

Plug-in car resources

Plug In America/
Electric Auto Association
www.pluginamerica.org
www.electricauto.org

Who Killed the Electric Car?
Must-see documentary.
Available now on DVD.
whokilledtheelectriccar.com

CalCars Plug-In Hybrid Project
www.calcars.org www.eaa-phev.org

National Plug-in Hybrid Campaign
www.pluginpartners.org

Chrysler
Sprinter PHEV

Plug-In Hybrids: The Cars that will Recharge America
a book by Sherry Boschert
www.sherryboschert.com

EV World Online Magazine
www.evworld.com

Plug In America advocates the use of plug-in cars, trucks and SUVs powered by cleaner, cheaper, domestic electricity to reduce our nation's dependence on petroleum and improve the global environment. Join us.

Electric Auto Association
www.electricauto.org

Why Plug-in Cars?

Plug-in Prius Converson

No Gas Required.
Zero Emissions.
No Noise.
No kidding.

Toyota
RAV4 EV

Electric Auto Association

Toyota RAV4 EV

All-electric
1997-2003

All-Electric Range: 125 miles
Top Speed: 80 mph
Weight: 3480 pounds
Motor: 50 kW perm. magnet
Batteries: Nickel Metal Hydride (NiMH)
Charger: 208/240 volt/30 amp; 6 kW inductive
Battery Capacity: 27 kWh

Tesla Motors Roadster

All-electric
For sale now

All-Electric Range: 200 miles
Top Speed: 130 mph
Weight: 2500 pounds
Motor: 185 kW (248 hp peak)
Batteries: Lithium-Ion
Charger: 120 to 240 volts; conductive
Battery Capacity: 56 kWh

AC Propulsion EBox

All-Electric
For Sale Now

All-Electric Range: 150 mi.
Top Speed: 95 mph
Weight: 2970 pounds
Motor: 120 kW AC Induction
Batteries: Lithium-Ion
Charger: 120 to 240 volts; conductive
Battery Capacity: 35 kWh

• *How many miles can a battery electric car go between charges?*
An EV has a full tank every morning. The RAV4 EV has a range of about 125 miles on one full charge. The Tesla Roadster about 200 miles. The Tesla, like many new EVs, will be capable of charging at any electric outlet.

• *How many miles can a plug-in hybrid (PHEV) go on electricity?*
Plug-in Priuses have been built with all-electric ranges 10-40 mile. The 2010 Chevy Volt, for example, will have an all-electric range of 40 miles. After that, the gasoline engine kicks in to recharge the batteries.

• *How long to recharge the batteries of electric cars and plug-in hybrids?*
A few hours overnight will charge to full. Electricity is plentiful and cheap at night.

• *Where do you charge?*
Usually overnight in one's garage. There are also public chargers for electric cars in parking garages and shopping centers. (see www.evchargernews.com).

• *Is it expensive to charge?*
Less than $1 to fill a plug-in hybrid; $2-4 for an all-electric car.

• *Aren't electric vehicles inefficient?*
EVs are the most efficient cars on the road. Compare the gas and electric RAV4:
RAV4 Gas: MPG - 21(city)/26(hwy);
Greenhouse gas emissions: 8 tons/year
RAV4 EV: MPG (equiv) - 125/100;
Greenhouse gas emissions: 3.9 tons/year
http://www.fueleconomy.gov/feg/bymodel/2002_Toyota_RAV4.shtml

• *How does a plug make hybrids better?*
Plugging in a plug-in hybrid is like filling up with 60-cent per gallon gasoline. And you still have a gas tank for longer trips.

• *Isn't hydrogen the solution?*
No. Hydrogen fuel cell cars are 4X less efficient than EVs when the hydrogen is produced from electricity and 1.4X less efficient made from natural gas. Where and how will the hydrogen be stored? Who will pay the billions required for this new infrastructure? (Hint - us taxpayers.) With plug-in cars, the infrastructure is already in place - the electric grid.

• *What about the pollution created making the electricity? Aren't you just moving the pollution?*
No. Emissions are lower even on the 49%-coal U.S. grid. Moving the pollution away from population centers is a good thing.

The US Dept. of Energy says utilities have enough excess generating capacity at night to charge 185 million plug-in hybrids. While electricity is getting cleaner and more renewable every year, even the cleanest gasoline car becomes more polluting over time. An electric car, on the other hand, just gets cleaner over time as the grid gets cleaner.

• *Can I charge a plug-in car with solar or wind power?*
Yes. The cleaner the power, the cleaner the car. Putting solar panels on your home or business makes even more sense with a plug-in car. The investment pays off faster, and the car becomes truly zero-emission.

What can I do?

- Join the Electric Auto Association.
- Tell your local auto dealer you won't buy a new car until it has a plug.
- Sign the pluginpartners.org petition.
- Tell your friends to see the film Who Killed the Electric Car?
- Buy or make an electric conversion (www.evfinder.com).

www.electricauto.org