



The Truth About Auto Emissions

2012

Electric Auto Association (EAA)

"Promoting the use of electric vehicles since 1967"

"EAA EV drivers have logged over 14 million clean miles"

Vehicle emissions pose a serious threat to public health. – American Lung Association³

Not matter where you live in the US, EVs are a good choice for reducing global warming and saving money on fuel costs. EVs outperform gas-powered vehicles for global warming emissions. – Union of Concerned Scientists (Press Release April 16, 2012)

What are emissions and why are they bad?

Components of air pollution include¹: 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 becomes 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 (O₃), some HCs cause cancer and others can irritate mucous membranes. Ozone (O₃) 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 (CO₂), although naturally occurring, can also 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 wind². Gasoline and diesel powered cars, trucks, and buses are the major sources of NOx and VOCs.

The American Lung Association states³, "smog and fine particle emissions generated by the combustion of petroleum fuels cause immediate and lifelong respiratory impacts. Greenhouse gases emitted today will continue to threaten respiratory health for generations to come."

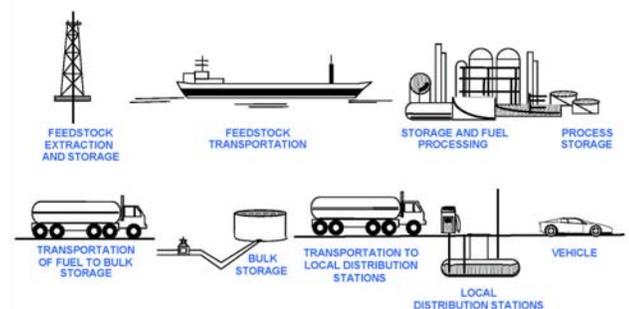
Where do the emissions come from?

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".

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 CO₂ 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, reducing their effectiveness in controlling emissions. On the other hand, **EVs** (the only ZEVs available) **produce no emissions and do not require on-board emissions systems!**

Full Fuel Cycle...

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



¹ www.evadc.org/pwrplnt.pdf & www.casteyanqui.com/ev/longtailpipe

² www.epa.gov/oar/oaqps/gooduphigh/

³ www.lung.org/associations/states/california/assets/pdfs/advocacy/clean-cars-campaign/zev-road-to-clean-air_final.pdf

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

ZEVs are critical and necessary to meet California's Long-term air quality and reduction in greenhouse gas (GHG) emission goals. – American Lung Association³

Over 90% of Californians live in areas that fail to meet federal air standards. – American Lung Association⁴

“Off-peak” electricity production and transmission capacity could fuel 70% of the US light-duty vehicles. -- U.S. Dept. of Energy, 2006
www.pnl.gov/news/rel/lease.aspx?id=204

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The only emissions associated with EVs are those released during the generation of electricity (from coal, natural gas, etc.). Those emissions will be reduced as electricity generation includes more renewable sources (as required by law), 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.

The U.S. Dept. of Energy⁵ compared lifecycle emissions of EVs to gas-powered vehicles and concluded: **EVs reduce the annual pounds of CO₂ emissions by 38% using the**

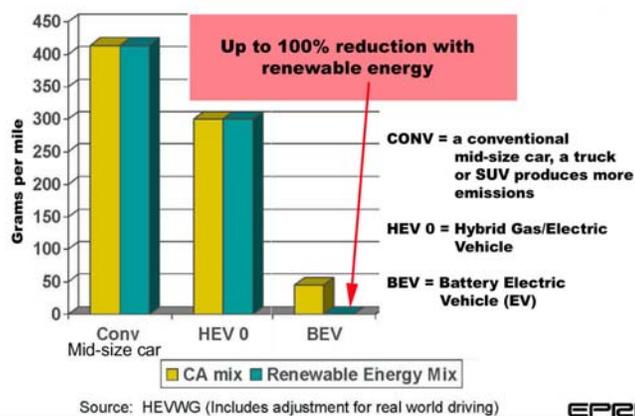
U.S. national average electricity source mix; and 67% using the CA electricity source mix. Even in a state with 73% of electricity generated from coal (like West Virginia), the CO₂ emissions are reduced by 24%. Coal powered electricity power plants do increase sulfur emissions, but emissions from central power plants are easier to control than emissions generated from millions of cars on the road. By law, future power plants must be more efficient and cleaner. As power plants utilize renewable energy sources, such as wind and solar energy, the full “well-to-wheels” emissions for EVs can reach zero! Simply put, it’s not possible to achieve zero “well-to-wheels” emissions in any vehicle that uses a gasoline or diesel engine.

The Union of Concerned Scientists report “State of Charge”⁶ evaluated regional electricity grids across the United States; compared the emissions generated by charging an EV with the emissions produced by gasoline-powered vehicles. The report concluded that, in the U.S.:

- 45% live in the “best” regions; EVs produce lower global warming emissions than even the most fuel-efficient gasoline hybrids on the market today.
- 38% live in “better” regions; EVs produce emissions comparable to the best gasoline hybrid vehicles.
- 17% reside in “good” regions; emissions from EVs are comparable to the most fuel-efficient non-hybrid gasoline vehicles.

Many EV drivers have not waited for power plants to switch to renewable electricity. They’ve installed photovoltaic (PV) systems on their homes to generate clean electricity from the sun. With EVs you actually have a choice for fuel sources (for electric generation) – including renewable sources – with gas-powered vehicles there are no other choices.

Greenhouse Gas Emissions Well to Wheels, California Mix, Renewable Energy Mix



About the Electric Auto Association

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.



Electric Auto Association

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⁴ http://www.lung.org/associations/states/california/assets/pdfs/advocacy/clean-cars-campaign/zev-road-to-clean-air_final.pdf

⁵ www.afdc.energy.gov/afdc/vehicles/emissions_electricity.html

⁶ http://www.ucsusa.org/clean_vehicles/smart-transportation-solutions/advanced-vehicle-technologies/electric-cars/emissions-and-charging-costs-electric-cars.html