The Truth About Auto Emissions

2009 | Electric Auto Association (EAA)

"Promoting the use of electric vehicles since 1967"

"EAA EV drivers have logged over 10 million clean miles"

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

"EVs substantially reduce all emissions that cause adverse health conditions in urban settings. Replacing a conventional vehicle with an EV reduces VOCs and CO by 100%, SO_x by 75%, NO_x by 69%, and PM_{10} by 31% in urban settings." – US Dept. of Energy (afdc.energy.gov)

What are emissions and why are they bad?

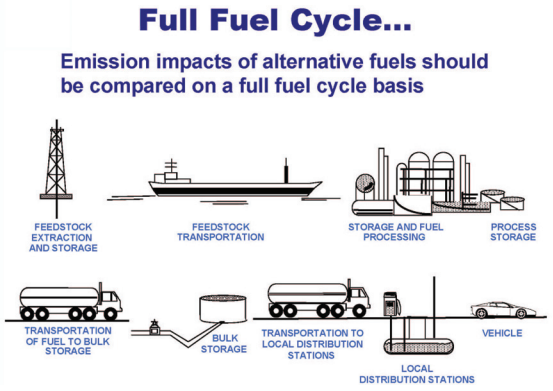
Components of air pollution include[1]: Carbon Monoxide (CO) – reduces the blood's ability to carry oxygen, aggravates lung and heart disease, and causes headaches, fatigue, and dizziness. Sulfur Dioxides (SOx) – when combined with water vapor in the air become the major contributor to acid rain. Nitrogen 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".



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/media-center/publications/lung-health-news/driving-californians-toward-good-health-electric-vehicles

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

"EVs create only 1 percent of the pollution generated from the cleanest gasoline vehicles. – American Lung Association

In 2007, over 100 million people lived in counties that did not meet EPA standards for at least one of the pollutants. – U.S. EPA

"The Electrical grid's off-peak capacity for power generation is sufficient to power 84% of commutes to and from work by cars, light trucks and SUVs without building a single new power plant." -- U.S. Department of Energy

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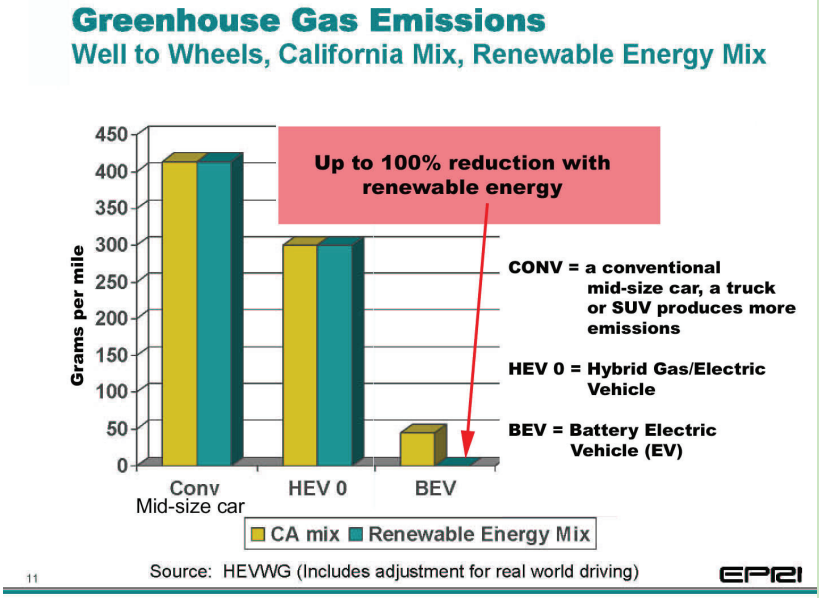
Electric vehicles (EVs) produce zero emissions from the vehicle itself – and are classified as ZEVs. The only emissions are those released during the generation of electricity (from coal, natural gas, etc.). However, even those emissions can be eliminated if the electricity is generated from renewable 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 U.S. Dept. of Energy, comparing lifecycle emissions, "***Electric vehicles also reduce the total (urban and rural) CO emissions by 96% and VOCs by 83%. With the electricity fuel mix in California, EVs reduce GHG emissions by 74%***."[6] 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 will be more efficient and even cleaner. As those power plants utilize renewable energy sources, such as wind and solar energy, the full "well-to-wheels" emissions for EVs will be zero! Simply put, it's not possible to achieve zero "well-to-wheels" emissions in any 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.

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.

[4] http://www.ucsusa.org/clean_vehicles/vehicle_impacts/cars_pickups_and_suvs/light-trucks-and-air.html
[5] http://www.ucsusa.org/clean_vehicles/vehicle_impacts/cars_pickups_and_suvs/light-trucks-and-air.html
[6] http://www.afdc.energy.gov/afdc/vehicles/emissions_electricity.html