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?

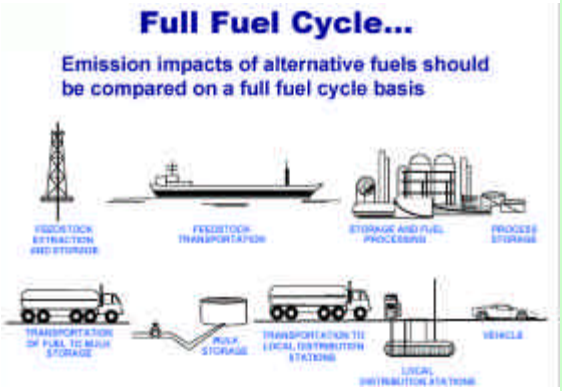
Components of air pollution include[1]: Carbon Monoxide (CO) – reduces the blood's ability to carry oxygen, aggravates lung and heart disease, and causes headaches, fatigue, and dizziness. Sulfur Dioxides (SOx) – when combined with water vapor in the air become the major contributor to acid rain. Nitrogen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



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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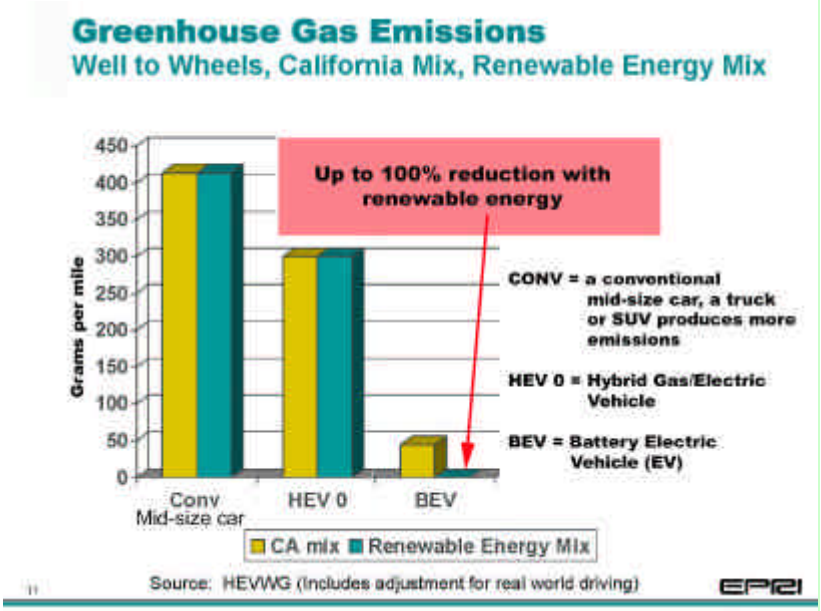
Rev: 20050516

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.

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.

Electric Auto Association

[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