Raging ThunderLizard Evangelist for Change

Is There Such a Thing as a Zero-Emissions Vehicle?

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Electric transportation represents an exciting technological option to reducing energy consumption and improving the environment. But is there such a thing as a zero-emissions vehicle?

Conventional vehicles produce a number of principal pollutants, including:

Ground-Level Ozone: Nitrogen Oxide (NOx) + Volatile Organic Compounds (VOCs) + Sunlight.

Particulate Matter: a mixture of solid particles and liquid droplets often seen in the air as soot and smoke. Particulate matter includes inorganic salts, acids, metals, water, organic compounds, and soot-like material.

Carbon Monoxide: a colorless, odorless gas, which is emitted during the combustion of gasoline, wood, natural gas, and other fuels. A gas formed when carbon in fuel isn't burned fully. Motor vehicles are responsible for 60% of such emissions.

Lead: found near smelters and battery manufacturers. A toxic metal that was previously used in gasoline and most paints. Emitted into the air by lead battery manufacturing plants, lead battery recovery plants, smelter operations, and combustion of lead-containing coal.

Nitrogen Oxide: a yellowish-brown gas formed almost entirely by high-temperature combustion, such as burning of fuels in power generation plants, industrial boilers, cars, trucks, and furnaces.

Sulfur Dioxide: a colorless, odorless gas at low concentrations but has a pungent odor at higher concentrations. Emitted primarily from power plants that burn sulfur-containing coal, petroleum refineries, and sulfuric acid plants.

However, today, 95%-98% of harmful emissions have been eliminated in new conventional cars due to three-way catalytic converters, fuel injection, and computer-controlled engine management systems.

With electric cars, drive systems can be powered by domestically produced energy from a diverse array of feedstock. They have little to no emissions in operation and are highly energy-efficient. Once the energy is received, the electric vehicle uses it much more efficiently than a gasoline-fueled vehicle, with 88% actually driving the car. A conventional engine wastes 85% of the energy in the gasoline as heat and noise, leaving only 15% to drive the car. Electric transportation produces no tailpipe emissions and generates insignificant, ancillary emissions during operations.

While electric cars themselves are clean, generating the electricity to charge vehicle batteries produces air pollution and solid waste. Electricity is produced from power plants located throughout the country, transmitted to substations through high-voltage transmission systems, stepped down to lower voltage, and carried to homes and businesses through distribution systems. If electric power plants produce electricity using clean energy sources (solar, wind, geothermal, hydroelectric, tidal power), emissions are negligible. Electric vehicles are much cleaner overall than a conventional gasoline fuel car, even when including power plant emissions. However, coal-fired power plants produce emissions such as carbon dioxide, which contributes to global warming.

Coal is the number one source of the total U.S. electricity production (54%). Out of the entire U.S. electric industry, coal-fired power plants contribute 96% of sulfur dioxide emissions, 93% nitrogen oxide emissions, 88% of carbon dioxide emissions, and 99% of mercury emissions. Coal-fired power plants are the single largest source of mercury pollution in the United States. According to the National Wildlife Federation, just one drop of mercury– 1/70th of a teaspoon– can contaminate a 25-acre lake to the point where fish are unsafe to eat. Not only are methylated mercury compounds toxic, but highly bio-accumulative as well. The increase in mercury as it rises in the aquatic food chain results in relatively high levels of mercury in fish consumed by humans.

The next biohazards to consider are toxic lead and caustic sulfuric acid used in electric car battery packs. Batteries contain gallons of acid and have the potential to produce a tremendous amount of pollution. Many vehicle batteries contain toxic elements or produce toxic emissions, which could make battery production, transport, use, and disposal a significant solid waste issue. The United States must consider how to safely dispose of or recycle these batteries.

In some models, batteries for a single electric car require about 1,000 pounds of lead, so the proliferation of electric cars using lead-acid batteries will greatly increase the demand for the noxious heavy metal. The greater demand for lead, the greater the pollution threat from mining, smelting, transporting, using, and disposing of it. However, according to several studies, lead recycling in the U.S. now accounts for 93% - 98% of all lead batteries now manufactured.

Electric vehicles reduce the amount of pollution in the city, but increase the amount of pollution in the coal-fired power plant locations. Pollution is reduced in my backyard, but increases in my neighbor's. Do these pollution threats outweigh the benefits of an Alternate-Fueled Vehicle? The benefits of an Alternative-Fueled Vehicle are:

✔ Reduced dependence on foreign oil.

✔ Less air pollution and fewer emissions of greenhouse gases.

✔ Reduced fuel and maintenance costs.

✔ Electric vehicles have fewer moving parts to service and replace.

Under Senate Bill 200, a state agency op-

erating a fleet of more than 15 vehicles may not purchase or lease after September 1, 1991, any motor vehicle unless that vehicle is capable of using compressed natural gas, liquefied natural gas, liquefied petroleum gas, methanol or methanol/gasoline blends of 85% or greater, ethanol or ethanol/gasoline blends of 85% or greater, or electricity. Since September 1996, the percentage of state fleet vehicles that must be capable of operating on alternative fuels is 50%.

So, the question remains "Is there such a thing as a zero-emissions vehicle?" No, the fact is there really is no such thing as an absolutely "clean car" if you consider everything associated with the manufacturing and recycling of the vehicle's components and power source.

The University of Texas Health Science Center at Houston has chosen to purchase a GEM (Global Electric Motorcar) as the newest addition to the Maintenance fleet at the Medical School. GEM is all-electric and licensed for the road. A member of the DaimlerChrysler family and featuring an easily seen, high-profile design, GEM is constructed with an advanced aluminum space frame and a lightweight plastic body.

GEM has the benefits of an alternate-fueled vehicle, such as no exhaust emissions. The one drawback is six Trojan 12-volt deep-cycle lead-acid batteries. GEM has a driving range of 30 to 35 miles and automotive-type batteries that fully charge in about eight hours. There are no special chargers, since GEM plugs into a standard 110-volt household outlet.

GEM is the first multipurpose Neighborhood Electric Vehicle (NEV) automotive engineered for both street and turf, has the capacity for two passengers, and room for items such as groceries, packages, and golf equipment. Numerous studies indicate that about 75% of all vehicle miles traveled in the United States are for short trips made by one person. On any given day, most people drive to only one or two locations, for a total of approximately 25 miles.

GEM is the University's latest step toward becoming more sustainable and complying with Senate Bill 200. But is it the right step? The potential health or safety risks associated with widespread electric vehicle use have not yet been fully evaluated, and in-depth comparative studies must be conducted on other AFVs.

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