

## An Introduction to Green Vehicles

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### ABSTRACT

*A green vehicle or clean vehicle or eco-friendly vehicle or road motor vehicle that produces less harmful impacts to the environment than comparable conventional internal combustion engine vehicles running on gasoline or diesel, or one that uses certain alternative fuels. Presently, in some countries the term is used for any vehicle complying or surpassing the more stringent European emission standard (such as Euro 6), or California's zero emissions vehicle standards (such as ZEV, ULEV, SULEV, PZEV), or the low carbon fuel standards enacted in several countries. Green vehicles can be powered by alternative fuels and advanced vehicle technologies and include hybrid electric vehicles, plug-in hybrid electric vehicles, battery electric vehicles, compressed – air vehicles, hydrogen and fuel cell vehicles, neat ethanol vehicles, flexible fuel vehicles, natural gas vehicles, clean diesel vehicles, and some sources also include vehicles using blends of biodiesel and ethanol fuel or gasohol. In November 2016, with an EPA-rated fuels economy 136 miles per gallon gasoline equivalent (mpg-e) (1.7L/100Km), the 2017 Hyundai Ioniq Electric became the most efficient EPA-certified vehicle considering all fuels and of all years, surpassing the 2014-2016 model year all –electric BMW.*

### INTRODUCTION

An environmental analysis extends beyond just the operating efficiency and emissions. A life-cycle assessment involves production and post-use considerations. A cradle –to-cradle design is more important than a focus on a single factor such as energy efficiency.

### ENERGY EFFICIENCY

Cars with similar production of energy costs can obtain, during the life of the car, large reductions in energy costs through several measures.

- ✓ The most significant is by using alternative propulsion:
- ✓ An efficient engine that reduces the vehicle's consumption of petroleum or that uses renewable energy sources throughout its working life.
- ✓ Using bio fuels instead of petroleum fuels.
- ✓ Proper maintenance of vehicles such as engine tune-ups, oil changes, and maintaining proper tire pressure can also help.
- ✓ Removing unnecessary items from a vehicle reduces weight and improves fuel economy as well.

Green vehicles include vehicles types that function fully or partially on alternative energy sources other than fossil fuel or less carbon intensive than gasoline or diesel.

### ELECTRIC AND FUEL CELL-POWERED:-

Electric cars are typically more efficient than fuel cell-powered vehicles on a tank-to-wheel basis. They have better fuel economy than conventional internal combustion engine vehicles but are hampered by range or maximum distance

attainable before discharging the battery. The electric batteries are the main cost. They provide a 0% to 99.9% reduction in CO2 emissions compare to an ICE (gasoline, diesel) vehicle, depending on the source of electricity.

### HYBRID ELECTRIC VEHICLES

Hybrid cars may be partly fossil fuel (or bio-fuel) powered and partly electric or hydrogen-powered. Most combine an internal combustion engine with an electric engine, though other variations too exist. The internal combustion engine is often either a gasoline or diesel engine. They are more expensive to purchase but cost redemption is achieved in a period of about 5 years due to better fuel economy.

### COMPRESSED AIR CARS, STIRLING VEHICLES, AND OTHERES

Compressed air cars, Sterling-powered vehicles, Liquid nitrogen vehicles are even less polluting than electrical vehicles, as the vehicle and its components can be made more environmentally friendly. Solar cars races are hold on a regular basis in order to promote green vehicles and other “green technology”. These sleek driver only vehicles can travel long distance at highway speeds using only the electricity generated instantaneously from the sun.

### IMPROVING CONVENTIONAL CARS

A conventional vehicle can become a greener vehicle by mixing in renewable fuels or using less carbon intensive fossil fuels. Typical gasoline-powered cars can tolerate up to 10% ethanol. Brazil manufactured cars that run on neat ethanol, though there were discontinued. Another available option is a flexible-fuel vehicle which allows any blend of gasoline and ethanol, and up to 85% in North America and Europe, and up to 100% in Brazil. Another existing option is to convert a

conventional gasoline-powered to allow the alternative use of CNG. Pakistan, Argentina, Brazil, Iran, India, Italy and China have the largest fleets of natural gas vehicles in the world. Diesel-powered vehicles can often transition completely to biodiesel, though the fuel is a very strong solvent, which can occasionally damage rubber seals in vehicle built before 1994. Biodiesel is the only fuel allowed in some North American national parks because spillages will completely biodegrade within 21 days. Biodiesel and vegetable oil fuelled, diesel engine vehicles have declared amongst the greenest in the US de Sol completion.

#### **ELECTRIC MOTOR AND PEDAL POWERED VEHICLES**

Multiple companies are offering and developing two, three, and four wheel vehicles combining the characteristics of a bicycle with electric motor. US Federal, State and Local laws do not clearly nor consistently classify these vehicles as bicycles, electric bicycles, motorcycles, mopeds, Neighborhood Electric Vehicle, motorised quadric cycle or as a car. Some laws have limits on top speeds, power of the motor, range, etc. while others do not.

#### **OTHER VEHICLES**

Public transportation vehicles are not usually included in the green vehicle category, but personal rapid transit (PRT) vehicles should be. All vehicles that are powered from the track have the advantage of potentially being able to use any sources of electric energy, including sustainable ones, rather than requiring liquid fuels.

Solar vehicles are electric vehicles powered by solar energy obtained from solar panels on the surface (generally, the roof) of the vehicle. Photovoltaic (PV) cells convert the sun's energy directly into electrical energy. Solar vehicles are not day-to-day transportation devices at present, but are primarily demonstration vehicles and engineering exercise, often sponsored by government agencies.

Wind-powered electric vehicles primarily use wind – turbines installed at a strategic point of the vehicle, which are then converted into electric energy causes the vehicle to people.

#### **ANIMAL POWERED VEHICLES**

Horse and carriage are just one types of animal propelled vehicle. Once a common form of transportation, they became far less common as cities grew and automobiles took their place. In dense cities, the waste produced by large number of transportation animals was a significant health problem. Oftentimes the food is produced for them using diesel powered tractors, and thus there is some environmental impact as a result of their use.

#### **HUMAN POWERED VEHICLES**

Human powered transport includes walking, bicycles, velomobiles, row boats, and other environmentally friendly ways of getting around. In addition to the health benefits of the exercise provided, they are far more environmentally friendly than most other options. The only downside is the speed limitations, and how far one can travel before getting exhausted.

### **BENEFITS OF GREEN VEHICLE USE**

#### **Environmental**

Vehicle emissions contribute to the increasing concentration of gases linked to climate change. In order of significance, the principle greenhouse gases associated with road transport are carbon dioxide, methane, and nitrous oxide. Road transport is the third largest source of greenhouse gases emitted in the UK, and account for over 20% of total emissions, and 33% in the United States of the total greenhouse gas emissions from transport, over 85% are due to CO<sub>2</sub> emissions from road vehicles. The transport sector is the fastest growing source of greenhouse gases.

#### **Health**

Vehicle pollutants have been linked to human ill health including the incidence of respiratory and cardiopulmonary disease and lung cancer. A 1998 report estimated that up to 24000 people die prematurely each year in the UK as a direct result of air pollution. According to the WHO, up to 13000 deaths per year among children (aged 0-4 years) across Europe are directly attributable to outdoor pollution. The organisation estimates that if pollution levels were returned to within EU limits, more than 5000 of these lives could be saved each year.

#### **Monetary**

Hybrid taxi fleet operators in New York have also reported that reduced fuel consumption saves them thousands of dollars per year.

#### **Criticism**

A study by CNW marketing research suggested that the extra energy cost of manufacture, shipping, disposal, and the short lives of some of these types of vehicle (particularly gas electric hybrid vehicles) outweighs any energy savings made by their using less petroleum during their using lifespan. These types of argument are the long smokestack argument. Critics of the report note that the study prorated all of Toyota's hybrids research and development costs across the relatively small number of miles on the road, rather than using the incremental cost of building a vehicle, used 109000 miles (175000km) for the length of life of a Prius (Toyota offers a 15000 miles (240000km) warranty on the Prius' hybrid components, including the battery) and calculated that a majority of a car's cradle-to-grave energy gets expended during the vehicle's production, not while it is driven. Some study try to compare environmental impacts of electric and petrol vehicles over complete life cycle, including production, operation, and dismantling. In general, results differ vastly depending on the region considered due to difference in energy sources to produce electricity that fuels electric vehicles. When considering only CO<sub>2</sub> emissions, it is noted that production of electric cars generates about twice as much emissions as that of internal combustion cars. Some studies found that driving electric cars is less environmentally damaging in western US states than in eastern ones, where less electricity is produced using cleaner sources. Similarly, in countries like India, Australia, or China, where large portion of electricity is produced by using coal, driving electrical vehicle would cause larger environmental damage than driving petrol vehicles. When justifying use of electric cars over petrol cars, these kinds of studies do not provide sufficiently clear results. The use of Vehicles with increased fuel efficiency is usually considered

positive in the short term but criticism of any hydrocarbon based personal transport remains. The Jevos Paradox suggests that energy efficiency programs are often counterproductive, even increasing energy consumption in the long run. Many environmental researchers believe that sustainable transport may require a move away from hydrocarbon fuels and from our present automobile and highway paradigm.

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