

Frequently Asked Questions about Alternative Fuels

What is the Department of Energy's (DOE) definition of an alternative fuel?

Alternative fuels are substantially non-petroleum and yield energy security and environmental benefits. DOE currently recognizes the following as alternative fuels: methanol and denatured ethanol as alcohol fuels (alcohol mixtures that contain no less than 70% of the alcohol fuel), natural gas (compressed or liquefied), liquefied petroleum gas, hydrogen, coal-derived liquid fuels, fuels derived from biological materials, and electricity (including solar energy). DOE can expand this list when new fuels are developed and approved as meeting this definition.

What are the characteristics of the alternative fuels? (Source: ABC's of AFVs, 5th Edition)

	Compressed Natural Gas (CNG)	Ethanol (E85)	Liquefied Natural Gas (LNG)	Liquefied Petroleum Gas (LPG)	Methanol (M85)
Chemical Structure	CH ₄	CH ₃ CH ₂ OH	CH ₄	C ₃ H ₈	CH ₃ OH
Primary Components	Methane	Denatured ethanol and gasoline	Methane that is cooled cryogenically	Propane	Methanol and gasoline
Main Fuel Source	Underground reserves	Corn, grains or agricultural waste	Underground reserves	A byproduct of petroleum refining or natural gas processing	Natural gas, coal or woody biomass
Energy Content per Gallon	29,000 Btu	80,460 Btu	73,500 Btu	84,000 Btu	65,350 Btu
Energy Ratio Compared to Gasoline	3.84 to 1 or 26% at 3000psi	1.38 to 1 or 72%	1.55 to 1 or 65%	1.36 to 1 or 74%	1.75 to 1 or 57%
Liquid or Gas	Gas	Liquid	Liquid	Liquid	Liquid

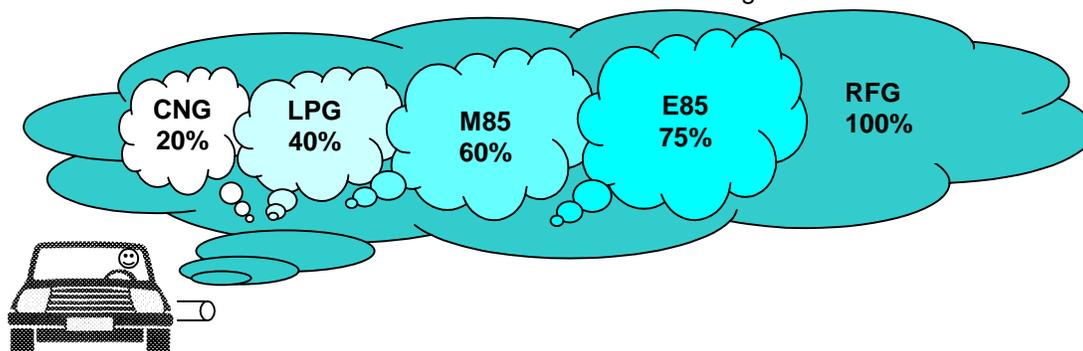
What are the current battery technologies for electric vehicles and how do they differ?

Lead Acid – This is the most commonly used technology and the least expensive. Generally, the vehicles have a range of less than 100 miles per charge, and the life of the battery is about three years. Chrysler, Ford, GM, and Toyota vehicles utilize this battery technology.

Nickel Metal Hydride (NiMH) – Offers a range of about 100 miles per charge, but has an increased cost. The life expectancy of the battery is about 100,000 miles. Chrysler, Ford (CA only), GM, Honda, and Toyota offer vehicles with NiMH technology.

Do alternative fuels offer any emissions benefits?

Yes, all of the alternative fuels reduce ozone-forming tailpipe emissions. The diagram below shows the percentage of combined CO and NO_x emissions for each alternative fuel as compared to reformulated gasoline (RFG). For example, the emissions from CNG vehicles are estimated to be 20% compared to 100% emissions from vehicles using RFG. CNG vehicles demonstrate an 80% reduction in ozone-forming emissions.



What is a GGE?

A gasoline gallon equivalent (GGE) is the volume of natural gas it takes to equal the energy content of one liquid gallon of gasoline. Since natural gas is not a liquid, its volume is measured in cubic feet (CF) and not gallons. Therefore, the GGE is a way of comparing equivalent volumes of fuel based on their energy content in British Thermal Units (Btu). The GGE of CNG is 123 CF and this volume of CNG has the same energy content as one gallon of gasoline (based on 929 BTU/CF of CNG and 114,264 Btu/gallon of gasoline). Since the other alternative fuels are liquids at room temperature their Btu is based on the energy in one liquid gallon and there is no need for a conversion or GGE.

What is the average price at the pump?

Like gasoline and diesel, the price of alternative fuels fluctuates in accordance with outside factors such as international economic changes and supply and demand. The accessibility of alternative fuels is regional, and geographic location can greatly effect the price at the pump. For example, propane is generally less expensive in southern states that have easy access to the Dixie pipeline, natural gas is more economical in urban areas and ethanol producers tend to sell their fuel in the Midwest to cut down on fuel transportation costs. Since LPG and CNG are also used outside the transportation sector, it is difficult to isolate the price charged for vehicle refueling. More detailed information can be obtained through the fuel associations or the Energy Information Administration.

Average prices compared to gasoline:

Gasoline	CNG	E85	LNG	LPG	M85
\$1.00	less	more	more	less	less

Are there incentives for purchasing Alternative Fuel Vehicles (AFVs)?

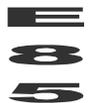
The federal government has income tax deductions, many states have incentives and some private companies offer rebates or discounts. Most of the incentives offset a percentage of the initial vehicle purchase cost. There are also federal and state laws that help ensure that the cost of alternative fuels remain competitive with gasoline. The incentives are listed by state at <http://www.fleets.doe.gov>.

How safe are the alternative fuels?

Since most people are familiar with gasoline they rarely question its safety. However, people that are unaccustomed to alternative fuels may have misconceptions or doubts about the safety of these fuels when used in vehicle applications. Outlined below are some of the safety issues associated with the use of alternative fuels.



The fuel is odorless and odorants must be added in order to detect leaks and spills. In the event of a leak, the gas will rise to the ceiling and create a potential risk for enclosed areas. Sturdy, heavy storage tanks must be used to avoid possible hazards from the high-pressure storage.



Because it is an alcohol, ethanol can be corrosive to some metals, gaskets and seals. E85 is less volatile than gasoline, despite the fact that it contains 15% gasoline. The ethanol component of E85 is denatured to prevent consumption.



The fuel is cooled cryogenically to -260° F and at this temperature bodily contact with the liquid fuel, cold metals or cold gas can cause cryogenic burns (frost bite). Methane gas detectors must be installed to detect leaks because odorants cannot be added to LNG.



Strong tank construction is required, but the pressure hazard is less than with CNG. LPG should be odorized and detectors are recommended to help detect leaks or spills. The fuel is extremely volatile and LPG fires burn twice as hot as gasoline fires.



Methanol is corrosive to several metals, rubberized components, gaskets and seals. Low flame luminosity makes M85 fires difficult to detect in the daylight. Unhealthy exposure can occur through fume inhalation, ingestion, or direct contact with skin.



Electrical circuits are self contained and grounded to limit the risk of shock from the vehicle frame. EV battery packs store enough energy to produce a dangerous or even lethal shock. Chemical burns may occur from electrolytes in the battery and protective gear must be worn.

Where can I go for more information?

National Alternative Fuels Hotline	800-423-1363	http://www.afdc.doe.gov/ or http://www.fleets.doe.gov
Clean Cities Hotline	800-224-8437	http://www.cities.doe.gov
Energy Information Administration	202-586-8800	http://www.eia.doe.gov
Natural Gas Vehicle Coalition	703-527-3022	http://www.ngvc.org
American Gas Association	703-841-8000	http://www.aga.com
LNG Express		http://www.lngexpress.com



National Ethanol Vehicle Coalition	800-385-8895	
Renewable Fuels Association	202-289-3835	http://www.ethanolRFA.org
Propane Vehicle Council	202-371-6262	http://www.propanegas.com/vehicle
National Propane Gas Association	708-515-0600	http://www.propanegas.com
American Methanol Institute	202-467-5050	http://www.methanol.org
California Energy Commission	916-653-4634	http://www.energy.ca.gov
The Electric Vehicle Association of the Americas	800-438-3228	http://www.evaa.org
Electric Transportation Coalition	202-508-5995	