U.S. Department of Energy
Energy Efficiency and Renewable Energy

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Alternative Fuels Data Center

Fuel Comparison Chart

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	Gasoline	No. 2 Diesel	Biodiesel(B20)	Compressed Natural Gas(CNG)	Electricity	Ethanol(E85)	Hydrogen	Liquified Natural Gas (LNG)	Liquified Petroleum Gas (LPG)	Methanol (M85)
Chemical Structure	C_4 to C_{12}	C_{10} to C_{20}	Methyl esters of C_{16} to C_{18} fatty acids	CH_4	N/A	CH_3CH_2OH	H_2	CH_4	C_3H_8	CH_3OH
Cetane Number	5 to 20	40 to 55	46 to 60	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Octane Number	86 to 94	8 to 15	~25	120+	N/A	100	130+	120+	104	100
Main Fuel Source	Crude Oil	Crude Oil	Soy bean oil, waste cooking oil, animal fats, and rapeseed oil	Underground reserves	Coal; however, nuclear, natural gas, hydroelctric, and renewable resources can also be used.	Corn, Grains, or agricultural waste	Natural Gas, Methanol, and other energy sources.	Underground reserves	A by-product of petroleum refining or natural gas processing	Natural gas, coal, or, woody biomass
Energy Content per Gallon	109,000 - 125,000 Btu	128,000 - 130,000 Btu	117,000 - 120,000 Btu (compared to diesel #2)	33,000 - 38,000 Btu @ 3000 psi; 38,000 - 44,000 @ 3600 psi	N/A	~ 80,000 Btu	Gas: ~6,500 Btu@3,000 psi; ~16,000 Btu@10,000 psi Liquid: ~30,500 Btu	~73,500 Btu	~84,000 Btu	56,000 - 66,000 Btu
Energy Ratio Compared to Gasoline			1.1 to 1 or 90% (relative to diesel)	3.94 to 1 or 25% at 3000 psi; 3.0 to 1 @ 3600 psi		1.42 to 1 or 70%		1.55 to 1 or 66%	1.36 to 1 or 74%	1.75 to 1 or 57%
Physical State	Liquid	Liquid	Liquid	Compressed Gas	Electricity	Liquid	Compressed Gas or Liquid	Liquid	Liquid	Liquid
Environmental Impacts of Burning Fuel	Produces harmful emissions; however, gasoline and gasoline vehicles are rapidly improving and emissions are being reduced.	Produces harmful emissions; however, diesel and diesel vehicles are rapidly improving and emissions are being reducedespecially with after-treatment devices.	Reduces particulate matter and global warming gas emissions compared to conventional diesel; however, NOx emissions may be increased.	CNG vehicles can demonstrate a reduction in ozone-forming emissions compared to some conventional fuels; however, HC emissions may be increased.	EVs have zero tailpipe emissions; however, some amount of emissions can be contributed to power generation.	E-85 vehicles can demonstrate a 25% reduction in ozone-forming emissions compared to reformulated gasoline.	Zero regulated emissions for fuel cell-powered vehicles, and only NOx emissions possible for internal combustion engines operating on hydrogen.	LNG vehicles can demonstrate a reduction in ozone-forming emissions compared to some conventional fuels; however, HC emissions may be increased.	LPG vehicles can demonstrate a 60% reduction in ozone-forming emissions compared to reformulated gasoline.	M-85 vehicles can demonstrate a 40% reduction in ozone-forming emissions compared to reformulated gasoline.
Energy Security Impacts	Manufactured using imported oil, which is not an energy secure option.	Manufactured using imported oil, which is not an energy secure option.	Biodiesel is domestically produced and has a fossil energy ratio of 3.3 to 1, which means that its fossil energy inputs are similar to those of petroleum.	CNG is domestically produced. The United States has vast natural gas reserves.	Electricity is generated mainly through coal fired power plants. Coal is the United States most plentiful fossil energy resource and coal is our most economical and price-stable fossil fuel.	Ethanol is produced domestically and it is renewable.	Hydrogen can help reduce U.S. dependence on foreign oil by being produced by renewable resources.	LNG is domestically produced and it typically costs less than gasoline and diesel fuels.	LPG is the most widely available alternative fuel with an estimated 3,400 refueling sites nationwide. The disadvantage of LPG is that 45% of the fuel in the U.S. is derived from oil.	Methanol can be domestically produced from renewable resources.
Fuel Availability	Available at all fueling stations.	Available at select fueling stations.	Available in bulk from an increasing number of suppliers. There are 22 states that have some biodiesel stations available to the public.	More than 1,100 CNG stations can be found across the country. California has the highest concentration of CNG stations.	Most homes, government facilities, fleet garages, and businesses have adequate electrical capacity for charging,	Most of the E-85 fueling stations are located in the Midwest, but in all, approximately 150 stations are available in 23 states.	There are only a small number of hydrogen stations across the country. Most are available for private use only.	Public LNG stations are limited (only 35 nationally), LNG is available through several suppliers of cryogenic liquids.	Propane is the most accessible alternative fuel in the U.S. There are more than 3,300 stations nation wide.	Methanol remains a qualified alternative fuel as defined by EPAct, but it is not commonly used.

				Home fueling will be available in 2003.	but, special hookup or upgrades may be required. More than 600 electric charging stations are available in California and Arizona.					
Maintenance Issues			Hoses and seals may be affected with higher-percent blends, lubricity is improved over that of conventional diesel fuel.	High-pressure tanks require periodic inspection and certification.	Service requirements are expected to be reduced. No tune-ups, oil changes, timing belts, water pumps, radiators, or fuel injectors are required. However, the batteries must be replaced every 3-6 years.	Special lubricants may be required. Practices are very similar, if not identical, to those for conventionally fueled operations.	When hydrogen is used in fuel cell applications, maintenance should be very minimal.	High-pressure tanks require periodic inspection and certification.	Some fleets report service lives that are 2-3 years longer, as well as extended intervals between required maintenance.	Special lubricants must be used as directed by the supplier and M-85-compatible replacement parts must be used.
Safety Issues (Without exception, all alternative fuel vehicles must meet today's OEM Safety Standards)	Gasoline is a relatively safe fuel since people have learned to use it safely. Gasoline is not biodegradable though, so a spill could pollute soil and water.	Diesel is a relatively safe fuel since people have learned to use it safely. Diesel is not biodegradable though, so a spill could pollute soil and water.	Less toxic and more biodegradable than conventional fuel, can be transported, delivered, and stored using the same equipment as for diesel fuel.	Pressurized tanks have been designed to withstand severe impact, high external temperatures, and automotive environmental exposure.	OEM EVs meet all the same vehicle safety standards as conventional vehicles.	Ethanol can form an explosive vapor in fuel tanks. In accidents; however, ethanol is less dangerous than gasoline because its low evaporation speed keeps alcohol concentration in the air low and non explosive.	Hydrogen has an excellent industrial safety record; codes and standards for consumer vehicle use are under development.	Cryogenic fuels require special handling procedures and equipment to properly store and dispense.	Adequate ventilation is important for fueling an LPG-fueled vehicle due to increased flammability of LPG. LPG tanks are 20 times more puncture resistant than gasoline tanks and can withstand high impact.	Methanol can form an explosive vapor in fuel tanks. In accidents; however, methanol is less dangerous than gasoline because its low evaporation speed keeps alcohol concentration in the air low and non explosive.

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