

# AFV - Alternative Fuel Vehicle

## What is an AFV?

An Alternative Fuel Vehicle is a vehicle that runs on fuels other than petroleum-based products such as gasoline or diesel. Alternative Fuel Vehicles run on compressed natural gas, ethanol, liquefied petroleum gas, methanol or electricity.

## How many AFV's are used today?

There are over 300,000 alternative fuel vehicles in use in the United States, including some in Maryland. However, AFV's are used all over the world.

## Examples of AFV Users in Maryland

- Maryland Department of the Environment
- Catonsville Community College
- Airport Super Shuttle
- BWI Shuttle
- Montgomery County
- Prince George's County
- Barwood Cab Fleet of Kensington
- Giant Supermakets in Landover
- Washington Gas
- Baltimore Gas and Electric (BGE)
- Bell Atlantic
- Baltimore Municipal Golf Course
- U.S. Postal Service



## How are AFV's powered if they don't use gasoline?

Fuels used to power AFV's are called alternative fuels. These alternative fuels can be made from coal, wood, urban waste and even agricultural products like grain. They also include natural gas and electricity.

## Are AFV's new?

No. Before gasoline was introduced in the 1800's, alternative fuels were widely used. In fact, one of Henry Ford's early prototypes was fueled by ethanol. It was not until technology progressed and production became less expensive that gasoline became the popular choice for fuel. State and Federal directives for environmental and energy security protection have propelled the sudden renewed interest in alternative fuels.

## Why should people use AFV's?

AFV's create less air pollution than conventional vehicles. Less air pollution means cleaner air and a healthier environment. In addition, they require less dependence on foreign oil purchases.

## **Clean Air Benefits**

Emissions from vehicles contain pollutants that contribute to air pollution. These pollutants are directly related to many human health and public welfare problems that we see evidence of today. Examples of air pollutants include particulate matter, carbon monoxide and ground-level ozone. Ground-level ozone, more commonly known as smog, is Maryland's most severe air pollution problem. Using Alternative Fuel Vehicles can greatly reduce these pollutants.

## **Human Health Problems**

- Ground-level ozone reduces lung function and causes irritation of the eyes, nose and throat. The young, elderly and persons with chronic illnesses are the most at risk, but even healthy adults can be affected by high levels of ozone.
- Emissions from vehicles irritate existing human health problems, especially illnesses of the respiratory tract such as asthma or emphysema.
- Pollutants and particles released by vehicle emissions can get into the lungs and eyes. They can cause shortness of breath, throat and eye irritation and in severe cases, chronic lung damage.
- Currently in Maryland, there are approximately 600,000 people who suffer from respiratory ailments that are agitated by the pollutants in vehicle emissions.

## **Public Welfare Problems**

- Marylanders drive about 135 million miles a day. This results in the release of air pollutants like nitrogen oxides and volatile organic compounds which form ground-level ozone (smog).
- Pollutants that are released into the air from vehicle emissions also reduce visibility by causing haze. Haze impairs the visual quality of nature, such as sunsets, horizons and landscapes, and can even interfere with aviation.
- Pollutants in the air from vehicle emissions can damage vegetation and deteriorate materials such as the paint on cars and the stone in buildings and statues. In fact, air pollution causes \$40 million worth of crop damage in Maryland every year.
- Air pollutants contribute to pollution in our waterways. In Maryland, about one quarter of the Chesapeake Bay's nitrogen pollution problem is attributed to air pollution, mainly from mobile sources, such as motor vehicles.

## **Energy Security Benefits**

Driving conventional vehicles requires the use of petroleum-based products such as gasoline or diesel fuel that are refined from crude oil. Some crude oil is found in the United States, but a significant amount is imported. Future projections and population increases indicate that oil consumption will increase with time. Additionally, oil is a non-renewable resource which means that it will some day run out. The use of Alternative Fuel Vehicles, vehicles that run on alternative fuels, help to alleviate the burden of energy security.

## **Conservation and Energy Security**

Americans use 5 million more barrels of oil per day than are produced domestically. This requires the United States to import over 50% of its oil. By the year 2010, we will import over 60%.

Overseas purchases of oil amount to approximately \$1 billion per week.

Because AFV's use alternative fuels, they can help to reduce our dependence on oil.

### **Tax Benefits**

The State of Maryland and the federal government have created tax credits to reward those who purchase Alternative Fuel Vehicles, either singularly or in fleets.

#### **State Tax Credit**

The State of Maryland offers tax credits to AFV owners whose vehicles weigh less than 26,000 lbs. as follows:

<b>Vehicle Weight</b>	<b>State Tax Credit</b>
0-5,000 lbs (i.e. sedan)	\$800
5-10,000 lbs (i.e. van)	\$1,600
10-26,000 lbs (i.e. heavy truck)	\$2,000
Electric Vehicles	\$1,600

#### **Federal Tax Credit**

The federal government also offers tax credits to those who purchase an AFV or to those who convert their vehicle's engine to be compatible with alternative fuels as follows:

<b>Vehicle Weight</b>	<b>Federal Tax Credit</b>
10-26,000 lbs (truck or van)	\$5,000
More than 26,000 lbs (truck or van)	\$50,000
Buses with seating for 20+ adults	\$50,000
All other vehicles (except off-road vehicles)	\$2,000

#### **Fleet Incentives**

The Baltimore and Washington Clean Cities Program offers rebates on the purchase of certain Alternative Fuel Vehicles for local and municipal governments and private businesses in Maryland. These rebates can be combined with state tax credits. Check their website at [www.fleets.doe.gov/](http://www.fleets.doe.gov/) for more information.

The Maryland Department of Transportation offers an incentive program as well. Check the WashCOG web site at [www.mwcoq.org](http://www.mwcoq.org) for more information.

#### **AFV Types**

Almost every major car manufacturer has an AFV model. Several types of Alternative Fuel Vehicles (AFV's) are available today that are designed to meet all types of needs.

Dedicated AFV's, for example, are vehicles that run on only one type of alternative fuel. In other words, a dedicated compressed natural gas vehicle can only run on compressed natural gas, not methanol or electricity.

Bi-fuel vehicles are different from dedicated vehicles because they can run on two different types of fuel, but not at the same time. A flex-fuel vehicle, however, can run on two fuels simultaneously.

Alternative Fuel Vehicles can be built in two ways. They can either be built by an Original Equipment Manufacturer (OEM) to run on alternative fuels or they can be converted to an AFV from a conventional car that used to run on gasoline (conversion vehicles). OEM vehicles tend to emit less air pollution than conversion vehicles so they are more beneficial to the environment.

### What Are Alternative Fuels Made of?

Alternative fuels are cleaner than conventional gasoline because they are less complex chemically. Therefore, they are more efficient and create less pollution. In addition, they are most often produced domestically from non-petroleum and renewable sources. The following table explains the composition and approximate cost of several alternative fuels:

	<b>Compressed Natural Gas (CNG)</b>	<b>Ethanol (E85)</b>	<b>Liquefied Petroleum Gas (LPG)</b>	<b>Methanol (M85)</b>	<b>Electricity</b>
Composition	Primarily methane; extracted from underground reserves	Grain, like corn, and agricultural waste; blend of 85% alcohol and 15% gasoline	By-product of natural gas or petroleum refining; at least 90% propane, 2.5% butane and the remainder of ethane and propylene	Produced from natural gas and can also be made from coal, wood and urban waste; blend of 85% methanol and 15% gasoline	Contained in rechargeable batteries that power the motor
Cost (In relation to gasoline)	About three-fourths of the price	Two times the price	Price varies from half the price to two times the price	One and one half times the price	One third to three quarters more than the price

Table taken from "An Introduction to Alternative Fuel Vehicles", *Chesapeake Bay Alternative Fuel Vehicle Source Book* (Maryland Energy Administration: Annapolis, MD)

## Glossary of Related Terms

<b>Alternative Fuels</b>	Fuels other than gasoline or diesel such as compressed natural gas (CNG), ethanol (E85), liquefied petroleum gas (LPG), methanol (M85) and electricity
<b>Bi-Fuel Vehicles</b>	Vehicles that can use either of two types of fuel, but not at the same time
<b>Compressed Natural Gas (CNG)</b>	An alternative fuel made primarily of methane which is extracted from underground reserves; it costs about three-fourths the price of gasoline
<b>Conversion Vehicles</b>	Conventional vehicles that were originally manufactured to run on gasoline and whose engines have been converted to run on alternative fuels
<b>Dedicated Vehicles</b>	Vehicles that use only one type of fuel
<b>Ethanol (E85)</b>	An alternative fuel made from grain, such as corn, or from agricultural waste; it is a blend of 85% alcohol and 15% gasoline and costs about two times the price of gasoline
<b>Electric Vehicles (EV)</b>	Vehicles that are generally powered by electricity through a rechargeable battery
<b>Flex-Fuel Vehicles</b>	A vehicle that can run on two or more fuels simultaneously, usually gasoline and either methanol or ethanol
<b>Fuel Cell</b>	Like a battery, a fuel cell uses chemical interactions to produce electricity; the chemicals are hydrogen, which is generally supplied by natural or landfill gas, and oxygen, which is generally supplied by air; the by-products of this process are electricity and water
<b>Hybrid Electric Vehicle (HEV)</b>	An electric vehicle that uses at least one other energy source such as an internal combustion engine which charges a battery or flywheel; the battery or flywheel is used as a reservoir of energy for the vehicle
<b>Liquefied Petroleum Gas (LPG)</b>	An alternative fuel that is the by-product of natural gas or petroleum refining; it is at least 90% propane and 2.5% butane with the remainder being ethane and propylene; the cost varies between half the price of gasoline and two times the price of gasoline
<b>Methanol (M85)</b>	An alternative fuel produced from natural gas which can also be made from coal, wood and urban waste; it is a blend of 85% methanol and 15% gasoline and costs about one and one half times the price of gasoline
<b>Original Equipment Manufacturer (OEM) Vehicle</b>	Term used for new vehicles that are designed and built by automakers to run on alternative fuels



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