

Once you have a vehicle, where do you get fuel? There are five major categories of refueling stations list in Table 3:

Table 3 - Fueling Station Categories

- Centralized public, accessible to the public in a central location
- Centralized fleet, accessible to fleet operators only and centrally located
- Mobile, non-stationary truck, tank or trailer for private and commercial use
- Residential, located at private residences
- Distributed, multiple fueling sites to support commercial fleet operations

Infrastructure needs to be developed to provide an adequate number of refueling and charging stations. In 2000, the Center for Urban Transportation Research (CUTR) conducted an inventory of AFVs and alternative fuel refueling stations (see Table 4). Since the CUTR study, five new E-85 refueling sites have been built in Florida and another three are under construction. Presently, most ethanol refueling stations are private and dedicated to supporting fleets, as local gasoline stations have not added ethanol to existing pumps. Ethanol, methanol and biodiesel refueling stations are similar to gasoline or diesel stations. The changes required to handle these AFV fuels are minor in relation to other alternative fuels.



Natural Gas Pipeline Gate Station in Titusville.

How do I find a station? The Alternative Fuels Data Center (AFDC) mentioned earlier maintains information on refueling sites. This information can be obtained through the hotline or on their web site using the interactive tool “Alternative Fuel Refueling Station Locator.” The Station Locator can be used to locate refueling and recharging stations available for fleet, public and private use. Knowing the city name or the Zip Code, the Station Locator will provide a map, the address, and related station operating information for fueling stations in the area. This

information should be verified before taking a long trip as changes occur.

In addition to the AFDC, Gold Coast and Space Coast Clean Cities Coalitions and EVRB will offer assistance in locating stations, along with the various national fuel provider associations. Florida has the added advantage of having facilities that produce ethanol, methanol, and biodiesel along with hydrogen. Extensive natural gas pipelines extend across Florida. In the case of electric vehicles, the grid is everywhere and so is the sun.

The Florida AFV Market

There are 222 million registered vehicles in the U.S. Of those registered throughout the country, DOE estimates that 430,000 are alternative fuel vehicles [18]. AFVs represent a small percentage of the total registered vehicles in Florida and the country.

Determining the exact number of AFVs is difficult, as registration forms do not always indicate fuel type. At the direction of CFFAB, DCA and FEO, the Center of Urban Transportation Research Center (CUTR) conducted an inventory of AFVs and alternative fuel refueling stations in Florida. The study, identified 5,731 AFVs and 516 refueling sites illustrated in Table 4.



Photovoltaic charging station for electric vehicles at University of South Florida.

Table 4 - Florida Vehicle and Refueling Inventory - CUTR [18]

Fuel Type	Total Vehicles	Total Sites
CNG	2,151	94
LPG	2,466	320
LNG	6	2
Ethanol - E85	601	2
EV	352	93
Biodiesel - B20	128	2
Methanol - M85	11	2
Hybrid/electric transit	5,731	516

Several factors affected the percentage of vehicles in fuel types and models in the CUTR inventory study. In 1999, auto manufactures started making some selected E-85 flex-fuel vehicle standard models. Therefore, flex-fuel and bi-fuel vehicles are capable of operating on conventional petroleum products, allowing some vehicles to be reported as AFVs, that may not actually operate on alternative fuels or support an alternative fuel refueling site. Table 4 does not account for this and puts an estimated 98,000 E-85 vehicles on the road in Florida [18]. Table 4 does account for vehicles actually using E-85 as a fuel.



Fuel station for ethanol and methanol at Florida Institute of Technology



Opening of electric vehicle maintenance facility at Florida Power and Light fleet maintenance.

Another factor is that EPA mandated a certain percentage of vehicle acquisitions in Federal, State and energy provider fleets be alternatively fueled, which accounts for the CUTR study finding that about half of the AFVs in Florida were operated by government agencies. The other half of the AFVs are private, business or local fleet operated vehicles not subject to any mandate. The greatest concentration of vehicles is in Clean Cities Coalitions and EVRB. Since the CUTR study, over a thousand new AFVs have been placed in service.

III. Government Regulations

Automobiles available on the market today are required to meet many government regulations covering a wide range of categories including safety, fuel economy, and emission. Automobile manufacturers seek to earn pollution credits in the manufacture and sale of AFVs.

Federal Government Regulations

Fleet managers are especially aware of government guidelines, as penalties are levied when regulations are not met. There are two federal laws fleet operators need to keep in mind: 1) the 1990 Clean Air Act Amendments (CAAA) and (2) the Energy Policy Act of 1992 (EPA) [19]. These Acts came into existence in response to concerns about the environment and our country's dependence on imported petroleum. They require certain fleets to acquire vehicles that operate on alternative fuels.



First in a series of CNG fueling stations forming a corridor of refuel sites.

In 1970, the CAAA sought to improve air quality nation wide. The Act's original goals were to reduce mobile source pollutants by requiring use of cleaner fuels. Several programs were created as initiatives to reinforce these objectives. Among these programs is the Clean Fuel Fleet Program (CFFP) administered by the U.S. Environmental Protection Agency (EPA). This program requires fleets in metropolitan areas with high ozone and/or carbon monoxide levels to acquire Clean Fuel Vehicles (CFV). These fleets can use any fuel as long as the vehicles acquired are certified to meet the EPA's low emission vehicle (LEV) standards or better, which are stricter emission standards than otherwise required by law.

The Clean Air Act set prescribed concentration limits for pollution emitted from cars, buses and trucks. The U.S. Environmental Protection Agency (EPA) established maximum concentration levels called National Ambient Air Quality Standards (NAAQS) for six criteria pollutants in ambient or open air in order to protect public health. The Act requires areas where pollutant concentration exceed the NAAQS to develop State Implementation Plans (SIP) to control emissions. Emission levels are classified marginal, moderate, serious, severe, and extreme for affected areas and designated as non-attainment when a level is not met for one or more contaminant.



Tour bus using biodiesel.

EPA's primary purpose is to increase energy security through energy conservation and increased use of domestic alternative fuels. The U.S. Department of Energy implements the EPA's Act by directing certain fleets in larger metropolitan areas to acquire Alternative Fuel Vehicles. An added benefit of EPA's Act is that most of the required vehicles exhibit lower emissions and meet the CFFP emission standards.

Fleets Covered by EPA's Act or CAAA

Federal, state and alternative fuel provider fleets are currently mandated by both EPA's Act and CAAA, whereas, municipal and private fleets are presently mandated only by CAAA. Coverage includes vehicles owned, operated, leased or controlled by the fleets. The law defines the criteria in number of vehicles, duty type, fueling capability and model years that qualifies fleets for this mandates. The laws do exempt certain vehicles such as law enforcement, emergency vehicles, non-road vehicles, those used for military purposes and other special cases.

Fleets affected are located in Consolidated Metropolitan Statistical Areas (CMSA) or cities that had a population of at least 250,000 at the time of the 1980 U.S. census. Table 5 contains a list of Florida CMSAs covered by CAAA or EPA's Act.

Table 5 - Consolidated Metropolitan Statistical Areas in Florida . [19]

CSMA Location	County
Daytona Beach	Flagler, Volusia
Jacksonville	Clay, Duval, Nassau, St. Johns
Lakeland-Winter Haven	Polk
Melbourne-Titusville-Palm Bay	Brevard
Miami-Ft. Lauderdale	Broward, Dade
Orlando	Lake, Orange, Osceola, Seminole
Pensacola	Escambia, Santa Rosa
Tampa-St. Petersburg-Clearwater	Hernando, Hillsborough, Pasco, Pinellas
West Palm Beach-Boca Raton-Delray Beach	Palm Beach

Fuels and Vehicles Defined by Federal Acts

CAAA defines a clean fuel as any power source for which a vehicle is certified to meet federal Clean Fuel Vehicle emissions standards. Clean fuels include alternative fuels, oxygenated fuels, reformulated gasoline and conventional gasoline. A CFV is a vehicle that is certified to meet low emission vehicle standards or better, and operates on the fuel for which the vehicle was certified as a LEV. The fleet operator must always use the clean fuel in the affected geographic area. In addition, EPCAct defines an alternative fuel as any fuel that is substantially non-petroleum and yields energy security and environmental benefits. EPCAct currently recognizes alternative fuels as defined in the Federal Register. Both, EPCAct and CAAA defines the number of new CFVs or AFV acquisitions needed by qualified fleets to meet requirements (see Appendix).

Programs and Policies

Clean Cities is a U.S. DOE nationwide initiative, begun in 1994, to encourage the use of alternative fuels, infrastructure and vehicles through grassroots groups in designated areas throughout the country. The program is a voluntary, locally based government and industry partnership to mobilize local stakeholders in the effort to expand the use of alternatives to gasoline and diesel fuel. The program seeks to improve the quality of life by using clean domestic fuels for transportation.

Under DOE's State Energy Program (SEP), individual states promote the conservation of energy, adoption of renewable energy technologies, as well as the reduction of energy demand and dependence on imported oil through the development and implementation of a comprehensive State Energy Plan. States may choose to allocate grant funds for activities that increase transportation efficiency, including programs to accelerate the use of alternative transportation fuels for government vehicles, fleet vehicles, taxis, mass transit and privately-owned vehicles. The Florida Energy Office of the Department of Community Affairs administers the SEP for Florida.

The U.S. Internal Revenue Service (IRS) oversees a regulation in EPCAct that can help you purchase an AFV. A \$2,000 to \$50,000 federal income tax deduction is available for the incremental cost to purchase or convert qualified business or personal clean fuel vehicles, except EVs eligible for the federal EV tax credit. The deduction is not amortized and must be taken in the year the vehicle is acquired with each fleet location having a limit of \$100,000. The amount of the tax deductions for qualified clean fuel vehicles is based on the gross vehicle weight (GVW) and types of vehicles and are listed in Table 6.

Table 6 - Tax deduction for weight and type of vehicle. [21]

Vehicle	Weight	Tax deduction
Truck or van	GVW of 10,000-26000 lb	\$5,000
Truck or van	GVW more than 26,000 lb	\$50,000
Buses	seating capacity of 20+adults	\$50,000
All other vehicles, off-road vehicles excluded		\$2,000

Also, EPCAct provides a tax credit up to \$4,000 or 10% of the purchase price of an EV used for business or personal use. Beginning in 2001, the size of the credit is reduced by 25% per year until the credit is fully phased out. To qualify for the credit, the vehicle must be powered primarily by an electric motor drawing current from batteries or other portable sources of electric current. All dedicated, plug-in only EVs and all series HEVs qualify. Also, some parallel HEVs qualify for a deduction. Information is available in IRS publication 535. IRS form 8834 can be used for this tax benefit.

The U.S. Department of Transportation administers the Congestion Mitigation and Air Quality (CMAQ) Improvement Program authorized by the Transportation Equity Act (TEA-21) until 2003. The CMAQ program funds projects and programs in non-attainment and maintenance areas to reduce transportation-related emissions.

State Legislation

In 1999, Governor Jeb Bush signed the Florida Clean Fuel Act, that established the Clean Fuel Florida Advisory Board to study alternative fuel vehicles and formulate and provide policy recommendations. The Board provides the Secretary of the Department of Community Affairs (DCA) with recommendations on how to expand and fund the use of AFVs in the state. The Board will dissolve in 2004 (F.S. § 403.42).

Florida presently does not have any incentives for promoting the use of AFV's. Several other states do have incentives, such as California and New York. At this time, the Clean Fuels Florida Advisory Board is developing a Transportation Plan that will include such recommendations.

The Department of Transportation receives excise taxes on gasoline and diesel sold at the pump to fund construction of highways, but some AFVs do not pay excise tax on their gas fuel. In order to offset the loss of excise tax on gasoline from AFVs, a person operating an AFV must purchase a decal annually from the Florida Department of Revenue as defined in State Statutes. The decal must be properly displayed on the vehicle in order to use gas refueling stations. State and local government AFV fleets are exempt from paying the decal fee (F.S. § 206.874 and F.S. § 206.877). Also, anyone who wishes to be a wholesale distributor of an alternative fuel must first obtain a license from the Florida Department of Motor Vehicles (r.F.S. § 206.89).



Florida Institute of Technonlgy student designed University solar race car.

In years past, electric vehicle owners had difficulty getting insurance at a reasonable cost. Now, electric vehicles are protected from insurance surcharges based on factors such as new technology, passenger payload, weight-to-horsepower ratio and the types of materials used to manufacture the vehicle (F.S. § 627.06535).

County governments can receive waste reduction credits for using yard clippings, clean wood waste or paper waste as feedstock for the production of clean-burning fuels such as ethanol (F.S. §. 403.706).



GM EV1 at start of SunDay Challenge 1997

IV. Making a Difference

Many transportation options exist today and a variety of fuels are available to power them. Each option presents a choice of benefits and cost. Alternative fuel vehicles usually cost more to purchase than conventional gasoline vehicles, from a few hundred to several thousand dollars. As an example; ethanol fueled vehicles were previously priced about three hundred dollars more than the gasoline version, but now are priced the same. Full-size electric vehicles are still the most costly with incremental costs averaging over 15 thousand.

As the price of AFVs varies, so does the cost of fuel. Some alternative fuels cost less than conventional gasoline or diesel fuel, which also affects the life cycle cost of the vehicle. The cost of fueling stations varies from a few thousand to over one hundred thousand based on the fuel type as infrastructure for AFVs is still being deployed. Maintenance expenses also vary, with some AFVs actually being less costly to service than gasoline vehicles due to the cleaner burning fuel. Electric vehicles have low periodic maintenance cost, but high battery replacement cost. Costs are dependent on the user's needs, the economy, and political and environment issues. As cost has continued to be a variable, so has no one fuel or vehicle proven to be the perfect choice for all needs and applications.

The major benefits AFVs offer over gasoline and diesel vehicles are reduced dependence on foreign oil and reduced emission of polluting gases. While a collective shift in favor of AFVs is needed, by being willing to make minor changes in activities and in some cases accept a slightly higher cost to use a personal AFV, an individual can make a difference. Change is never easy, but automotive manufacturers and fuel providers have made significant progress in making the differences described above reasonably transparent and cost-effective. It is up to each of us individually to make personal transportation choices that include both financial and environmental considerations. While policies may evolve over time, the basic issues remain the same: AFVs are an integral part of the solution.



Home fueling station for hydrogen/CNG powered car.