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PROPANE FOR TENNESSEE FLEETS: A PRIMER FOR MUNICIPAL/COUNTY OFFICIALS

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INTRODUCTION

This technical bulletin examines the basics of propane as a viable alternative transportation fuel for local government fleets in Tennessee. The University of Tennessee (UT) Municipal Technical Advisory Service (MTAS), Clean Cities Coalition of Tennessee and Tennessee Renewable Energy and Economic Development Council (TREEDC) are important resources available to interested fleet operators across the state. This guide presents the environmental and economic benefits of propane as an alternative transportation fuel.

BASIC INFORMATION

Propane, also known as liquefied petroleum gas (LPG), is an odorless, non-toxic hydrocarbon gas at normal pressures and temperatures. When pressurized, it is a liquid with an energy density 270 times greater than its gaseous form. Aside from scientific terms, propane is used to power roughly 190,000 vehicles in the United States and more than 14 million vehicles worldwide. It is a smart choice for many fleet applications including school buses, shuttle buses, taxis, and light-duty trucks.

Many people may ask what the differences are between propane and compressed natural gas (CNG). While natural gas occurs in nature as a mixture of methane and other gases, propane

is actually a byproduct of both petroleum refining and natural gas processing. Natural gas must be cleaned before being used, and byproducts of this process include hydrocarbons such as propane in addition to butane, ethane, and pentane. The difference between propane and natural gas in domestic use comes down to their energy efficiency, cost, compression, storage, and risk factors.

Propane provides more energy per unit of volume than compressed natural gas. While propane is usually measured in gallons (or liters), natural gas is found in cubic feet (or cubic meters). Natural gas provides more than 1,000 BTUs per cubic foot (0.0283 cubic meters); the same volume of propane in gaseous form provides about 2,500 BTUs. This means that propane contains about two and a half times more usable energy content. So, less propane is needed to produce the same amount of energy as compressed natural gas.

Both propane and compressed natural gas also can be used to power alternative fuel vehicles. Vehicles that run on either type require special tanks to hold the fuel; many cars are actually bi-fuel, which means they have additional tanks to hold gasoline. CNG must be kept at much higher pressure than propane, so the tanks are often larger and heavier, which can lower the vehicle's mileage. Vehicles that run on CNG tend

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to be more expensive than those that use LPG. Also, propane has a narrow flammability range, and its tanks are 20 times more puncture-resistant than gasoline tanks.

Questions being asked are how a propane vehicle works and can they perform comparable to other types of vehicles? Propane vehicles operate much like gasoline vehicles with spark-ignited engines. They also are similar to their gasoline counterparts with regard to power, acceleration, and cruising speed. Two types of fuel-injection systems are available — vapor and liquid injections. In both types, the propane is stored as a liquid in a low-pressure tank. In a vapor-injected system, liquid propane is controlled by a regulator or vaporizer, which converts the liquid to a vapor. In a liquid-injected system, fuel is delivered to the combustion chamber, or intake port, in a liquid form. This publication guides you through the costs, the benefits, several examples and more to ensure a higher level of knowledge for this efficient type of energy.

COST (VEHICLES AND PROPANE)

As far as the price for a propane vehicle, original equipment manufactured (OEM) light-duty propane vehicles can cost several thousand dollars more than comparable gasoline vehicles. However, due to federal tax credits, it may offset the increased vehicle cost. Many states have additional incentives that further support the purchase of a propane vehicle. Vehicle conversions may qualify as well for tax credits and other incentives. One of the driving forces for the popularity of this type of energy are lower maintenance costs. Propane's high octane rating and low-carbon and oil-contamination characteristics have resulted in documented engine life of up to two times that of gasoline engines.

The price of propane typically is based on the volume of fuel used. For the best success, fleet operators should develop relationships with their local propane marketers and station operators, who can provide them with the fair pricing and help them establish on site infrastructure at little or no cost if a fuel contract is executed. If no relationship is formed, the fuel price may be equal to or higher than gasoline. Local propane marketers are present in almost every community across the United States and can provide expertise and assistance.

BENEFITS

Propane autogas is the term used when it is discussed as an alternate vehicle fuel. Autogas is the most widely used alternative fuel in the world and has proven time and again to be safe and reliable. Although tax incentives are a plus, even without them, the price historically averages \$1 less per gallon than gasoline. Environmentally speaking, autogas vehicles emit significantly less harmful greenhouse gas emissions, reducing emissions by about 20 percent compared to gasoline vehicles. As mentioned earlier, propane is a non-toxic and non-poisonous fuel meaning that it dissipates into the atmosphere with no harm to the environment. If a fleet operator wants to convert existing vehicles to autogas, it is significantly cheaper than purchasing new alternative fuel vehicles. Although, there is not a significant difference in the performance of propane vehicles and gasoline vehicles, some have reported that their autogas vehicles have a quieter, smoother ride. Basically, its domestic availability, safety, and clean burning qualities are just a few in the long list of benefits from using propane vehicles.

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Southeast Propane Autogas Development Program
The Southeast Propane Autogas Development Program is a large-scale alternative fuel project. This project is especially aimed at building propane autogas infrastructure in the Southeast United States. It focuses on encouraging public and private fleets in the region to adopt propane autogas. This program will be able to convert more than 30 propane autogas fueling stations along high-traffic routes. It will also launch a wide-reaching communications campaign to increase awareness and usage of propane autogas in the Southeast. This program will be extremely beneficial. More than 1,200 vehicles are expected to stop using almost four million gallons of gasoline, and eliminate more than 4,000 tons of airborne pollutants annually. Other benefits to this program will be an increase in the number of clean tech jobs in the Southeast; reduced fuel and maintenance cost, which will save money for local businesses and municipalities alike; and hopefully a reinvestment in the economy because of savings on fuel.

EXAMPLES

Here are several examples of communities that have chosen this beneficial alternative fuel. In western Michigan, the Zeeland Public School District is using propane autogas in its school bus fleet. This district transports 9,000 students daily, and its buses travel approximately 750,000 miles in a given year. The district has been able to cut costs (roughly 30 percent) as well as emissions by adding nine buses fueled by propane autogas.

Across the country in Washington, the Department of Transportation for King County has added diverse on-site refueling methods for fleet vehicles fueled by propane autogas. This has enabled it to ensure high-

quality service with confidence in refueling abilities. This fleet has 16 vehicles fueled by propane autogas.

In Indiana, the Department of Transportation has converted nearly 600 of its light-duty vehicles to a bi-fuel system using both gasoline and propane autogas. The INDOT has installed refueling dispensers at 115 of its facilities across the state. Both departments of transportation have realized the huge savings from installing these infrastructures.

The Muscogee County Police Department in Columbus, Ga., recently converted 31 of its police vehicles to propane. The propane conversion offered the department the ability to improve air quality, reduce carbon dioxide and fluorocarbons in the air, and save money. Muscogee County projects about a \$35,000 to \$40,000 in savings with 31 vehicles during the year. Because propane is a cleaner and more efficient fuel, it creates less wear and tear on engines and helps them last longer.

Using a federal stimulus grant Cobb County, Ga., fitted propane tanks in the trunks of patrol cars. This cost \$5,800 to convert each patrol car. The county will have about 100 patrol cars running primarily on propane gas. Propane has many advantages. The county estimates it will save anywhere from \$250,000 to \$500,000 a year in fuel costs, depending on what gas prices are.

CONCLUSION

Propane is an affordable alternate fuel choice, and is environmentally friendly. Cities and communities that have already made the transition to using propane autogas for vehicles have noticed savings, and voice

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that it is a smart alternative. If more people learn about the benefits of switching to propane, and act on it, pollution levels may decrease and monetary savings could help the economy. To learn more about propane as a transportation fuel, visit the AFDC's Propane Fuels and Vehicles sections (www.afdc.energy.gov), contact your local Clean Cities coordinator (www.cleancities.energy.gov), or visit the Propane Education and Research Council (www.propanecouncil.org), and the National Propane Gas Association (www.npga.org) websites.

REFERENCES

"Propane Exceptional Energy." *Zeeland Public School District's Sustainable Solution*.

Propane Education and Research Council.
Web. 13 Dec 2012.

"Propane Exceptional Energy." *Government Fleets Realize Cost Savings With Propane Autogas*. Propane Education and Research Council.
Web. 13 Dec 2012.

"Southeast Propane Autogas Development Program." Overview. N.p. Web. 13 Dec 2012.
www.usepropaneautogas.com

"U.S. Department of Energy." *Energy Efficiency and Renewable Energy. Clean Cities*, n.d.
Web. 13 Dec 2012. www.cleancities.energy.gov

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