Natural Gas Fleet Applications

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Introduction

There are many options available for fleet managers who wish to convert their fleets to alternative fuel vehicles. The previous section provided an overview of alternative fuel options and their benefits and drawbacks. This section will provide information specific to the use of natural gas as an alternative fuel in fleets.

Natural gas vehicles (NGVs) are available for both heavy-duty and light-duty applications. Fueling stations, either private or public, are available in most states. However, as the demand for NGVs grows the number of fueling stations will need to increase to make natural gas a viable economic option as an alternative fuel.

The goal of this chapter is to provide the information necessary for fleet managers to determine if using vehicles fueled by natural gas is a viable alternative for their fleet.

Objectives

- Explain how to implement green fleets
- Learn about incentives for converting to natural gas fleets
- Learn about the availability and cost of natural gas
- Identify the advantages of using natural gas
- Understand how to safely handle natural gas

Greening of Fleets

There can be challenges to starting a green fleet, or converting an existing fleet to the use of alternative fuels. According to some industry experts, a successful plan to reduce fuel consumption and carbon emissions requires a long-term vision, incremental change, support from top management, and flexibility to make changes along the way.

There are compelling reasons *why* fleets should be green and deliberate steps on *how* to implement alternative fuels.[1]

Why Use Green Fleets?

- **Reduce operating costs** by improving efficiency, reducing life cycle costs, and reducing vulnerability to volatile fuel prices.
- **Reduce greenhouse gas emissions** by implementing the use of natural gas in vehicles, which are the primary source of greenhouse gases and urban air pollution.
- **Improve corporate image** by branding business strategies and appealing to public concerns about energy conservation and ecological sensibilities.

How to Implement Green Fleets

- **Get buy-in** from all management and staff levels, and be sure to communicate information about the benefits, goals, and targets frequently.
- **Create long-term objectives** and tangible goals based on best practices in the industry (such as baselines, benchmarks, and progress reports).
- **Avoid setting reduction goals in absolute numbers** for growing fleets or fleets just starting because absolute goals can impede growth.
- **Anticipate obstacles**, such as driver resistance, lag time between original equipment manufacturers' technology and market availability, and slower return on investment.
- **Move slowly** and implement change over time.
- **Improve vehicle use** with selection analysis and education of drivers.
- **Track and report progress** and share successes with employees, shareholders, and the public.

Natural Gas Fleets

Like coal and oil, natural gas is a fossil fuel. Natural gas has higher flammability due to its greater hydrogen content by volume; however, in gaseous form it has a lower energy density by volume than conventional liquid fuels. Unlike other fossil fuels, natural gas is a clean-burning fuel and emits lower levels of harmful byproducts into the air.

Natural gas is the product of organic matter (plants and animals) that have decomposed without the presence of oxygen. Natural gas may also be man-made out of organic waste materials. This renewable form of natural gas is commonly referred to as biogas. Swamps, marshes, landfills, sewers, and even agricultural manure are sources where biogas may be harvested because of the volume of decaying organic matter in these areas.

Methane: *A colorless, odorless, flammable gas that is the major constituent of natural gas and is released during the decomposition of plant or other organic compounds, as in marshes and coal mines.*

There are two forms in which natural gas is used as a fuel for vehicles, compressed natural gas (CNG) and liquefied natural gas (LNG). CNG and LNG are made of almost entirely methane (CH_4). Methane can be concentrated by pressure, which produces CNG, or by extremely cold temperatures, which produces LNG.

CNG

CNG is natural gas that has been compressed and stored onboard as a gas in high pressure tanks, typically around 3000-3600 psi. CNG is a very stable method of storage for containing natural gas over longer periods of time. There are currently five 2012 light-duty CNG vehicles available from companies such as GM, Ford, and Honda (see **Figure 1**). CNG vehicles typically hold the natural gas in composite tanks in trunk areas (see **Figure 2**).

Figure 1: *Factory available Honda Civic CNG passenger car. Source: NAFTC.*

Figure 2: *Corresponding trunk-mounted CNG tank. Source: NAFTC.*

LNG

LNG is produced by cooling natural gas to a temperature below -260°F (-162°C) at normal atmospheric pressure. It is stored under low to moderate pressure (<250 psi). If spilled, LNG will pool on the ground or floor, but will quickly evaporate into a gas.

A liquid at this temperature is called cryogenic, which means that it cannot and will not exist as a liquid at normal temperatures and pressures. It must be stored in double-walled, vacuum-insulated pressure vessels called dewars (see **Figure 3**).

Figure 3: *Cutaway of LNG tank showing dual walls and insulation. Source: NAFTC.*

Natural gas is colorless, tasteless, and nontoxic, although it can displace oxygen and cause suffocation in certain situations. Even though natural gas in its natural state is odorless, an aromatic is typically added so leaks can be detected. When it is processed, the aromatic compounds such as ethyl mercaptan and thiophenes—which contain sulfur, give natural gas its distinctive, pungent smell. The odorant is not harmful to breathe, nor does it affect the composition of the fuel. It should be noted that LNG is not odorized.

Incentives for Using Natural Gas in Fleets

Incentives propagate the growth and purchasing power within organizations that are needed for strong commercial markets. Incentives include partnership initiatives and pooled resources, financial subsidies, and informational tools. The following section discusses incentives available to fleet managers that augment efforts to implement use of natural gas in their fleets.

Recent surveys have confirmed that fleet operations are voluntarily purchasing alternative fuel vehicles to meet specific EPAct regulations and mandates by the federal government. Alternative fuel and advanced technology vehicles typically cost more than their conventional gasoline-fueled counterparts, and determining how to pay for these more expensive vehicles has become a growing concern for fleet managers across the country. Fortunately, there is financial help available.

Notes

Despite the fluctuating economy and budget woes, there are a record number of grants and incentives for funding alternative fuel vehicles that have been made available. For example, in 2009 the U.S. Department of Energy (DOE) made nearly $300 million of American Reinvestment and Recovery Act (ARRA) funding available through the Clean Cities program. This single grant funding opportunity is responsible for putting more than 9,000 alternative-fuel and energy-efficient vehicles on the road and establishing 542 fueling stations across the country.

Tax Incentives

The federal government offers vehicle buyers and owners a number of tax incentives to buy and operate natural gas vehicles. Previous examples include an income tax credit for alternative fuel infrastructure and an excise tax credit for sellers of natural gas. Laws and tax credits change often, so fleet managers should check the Alternative Fuels Data Center (AFDC) website for updated information.

Did You Know?

The federal government provides a number of grant programs to encourage the purchase and use of natural gas vehicles (NGVs).

To learn more, visit Natural Gas Vehicles for America at: www.ngvc.org

Federal Grant Funding

When it comes to grant opportunities, the federal government is by far the largest and most consistent source of funding. Many federal agencies offer funding opportunities, but the majority of funding for alternative fuel vehicles and transportation related projects comes from a handful of federal agencies, such as the U.S. Department of Energy (DOE), Department of Transportation (DOT), Environmental Protection Agency (EPA), and U.S. Department of Agriculture (USDA). Each of these agencies has information on their funding opportunities available on their respective websites.

To learn more about Improved Energy Technology Loans, visit:
http://lpo.energy.gov

The Improved Energy Technology Loans, which is run by the DOE, provides loan guarantees that can be issued for up to 100% of the loan amount and includes the purchase of alternative fuel vehicles.

State Grant Funding

Many states have developed aggressive grant funding programs over the past few years. While each state has different grant funding sources, the designated State Energy Office (SEO) is typically the largest alternative fuel vehicle grant funding source in each state. To make it easy to identify each state's SEO, the National Association of State Energy Officials (NASEO) publishes a directory of State Energy Offices online. The DOE's Alternative Fuels Data Center (AFDC) also publishes an interactive web-based map that allows users to click on any state to get information on alternative fuel vehicle incentives and funding sources.[3] There is a multitude of state-level funding programs for clean air vehicle and transportation projects, but visiting the NASEO and AFDC websites will provide the starting points for any fleet manager interested in state-level funding programs.

Tools to Help!
Every state has some form of tax credit or rebate for using alternative fuels.
To find state-specific tax incentives, visit: *www.afdc.energy.gov/afdc/laws/search*

Incentives for Natural Gas Production

The government recently doubled its estimate of the amount of natural gas reserves under U.S. soil. The Obama administration is working on incentives, such as shorter leases and expanded drilling options, in an effort to increase natural gas production. Natural gas is cleaner burning than conventional fuels and can be domestically produced, relieving some U.S. energy concerns. Individual states are implementing incentives for natural gas producers in hopes of not only providing more natural gas for vehicle use, but also to bolster local economies by growing the natural gas job market.

New legislative bills are being introduced to increase incentives for the production of natural gas from local biomass projects. Production of methane from biomass is a renewable fuel source. Tax incentives are available for companies and farms that can utilize biogas to offset the use of nonrenewable natural gas consumption.

Natural Gas Availability and Cost

Today, there are 300,000 miles of natural gas pipelines, thousands of interconnection points, and hundreds of storage facilities throughout the nation. Most fueling stations are CNG because fleets using LNG vehicles typically have a dedicated fueling infrastructure. All but two states have at least one private or public CNG fueling station (see **Figure 4**).

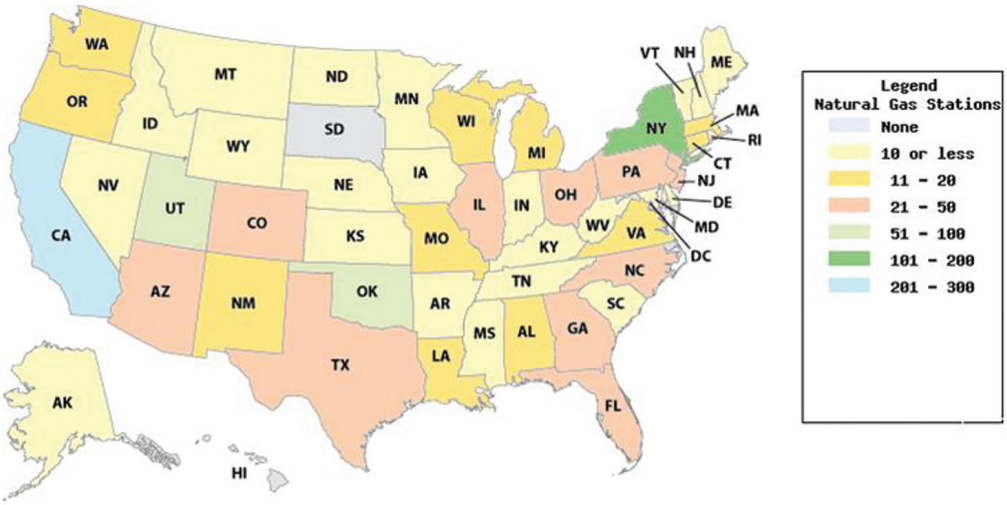

Figure 4: *Natural gas fueling stations. Source: AFDC.*

According to The Consumer Energy Center, consumption of natural gas has increased 145% nationwide since 2005, and the fueling infrastructure for natural gas vehicles continues to grow. As of January 2012, there were more than 1000 natural gas fueling stations in the U.S., and that number is projected to increase.[4]

Natural gas is a less costly alternative when compared to conventional gasoline. According to the National Renewable Energy Laboratory (NREL), the gasoline gallon equivalent (GGE) of CNG is considerably less than diesel fuel and gasoline. The difference in price is due primarily to the production of the fuel. Nearly 87% of natural gas is produced domestically, while conventional gasoline is dependent on foreign oil and is affected more by fluctuations in oil prices. Research shows the cost of diesel fuel is projected to increase at a linear rate of 5.6% per year, compared to a projected increase in natural gas of 1.6% per year (see **Figure 5**).

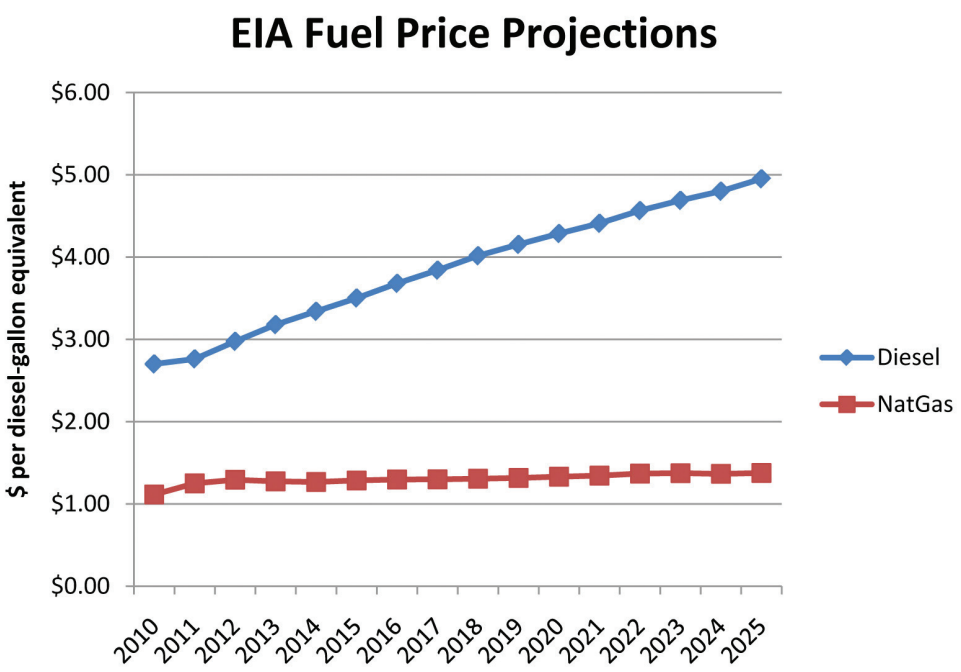

Figure 5: *Fuel price projections. Source: EIA.*

The benefits of using CNG are growing, and as economies of scale produce more demand, prices will come down. The following chart shows the national average price for CNG remains lower compared to conventional fuels. Between 2009 and 2012, the national average of gasoline and diesel fuel increased by more than a dollar while the price of CNG increased by only $0.50. The GGE of CNG is still much cheaper when compared to diesel fuel and gasoline (see **Figure 6**). Fluctuations in CNG prices will occur, but CNG is competitive in the fuel market.

Fuel	Area	2012 Cost	2009 Cost
Diesel ($ per gallon)	National Average	$3.46	$2.19
Gasoline ($ per gallon)	National Average	$3.37	$1.86
CNG ($ per GGE)	National Average	$2.13	$1.63

Figure 6: *Fuel type cost comparison, 2009-2012. Source: AFDC.*[5]

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Cost Factors

Key factors for the cost of natural gas include the cost of production and the demand for natural gas.

Production

One of the most important cost factors of developing natural gas as a viable alternative to conventional fuels is the ability and cost to extract natural gas and convert it for use as a commercially available fuel. The process of extracting natural gas has been a recent source of controversy. The primary method for extracting natural gas involves a process called hydraulic fracturing. There is some concern that hydraulic fracturing can result in increased seismic activity and land subsidence, but the primary concern comes from potential contamination of the surrounding water supply. There have been numerous reports of water supplies contaminated with the chemicals used in the fluid used for hydraulic fracturing. The Environmental Protection Agency (EPA) is investigating these claims. The impact hydraulic fracturing has on the price of natural gas can be significant. Hydraulic fracturing is the most cost-effective way for natural gas companies to extract natural gas from the earth. Increases in regulation and mitigation, and safety measures could lead to an increase in the production cost of natural gas, though regulations would ensure that hydraulic fracturing is environmentally sound.

Demand

Fleet owners and managers can benefit from the substantial savings in fuel costs and federal incentives. New natural gas vehicles can be custom built or vehicles can be converted to natural gas by installing a conversion system that makes natural gas the primary fuel. There are also natural gas vehicles available from original equipment manufacturers (OEM). Currently, federal regulations require that aftermarket conversion systems meet EPA and/or California Air Resources Board (CARB) emissions requirements depending on location. Other states may adopt the EPA and CARB standards for converting vehicles to run on natural gas. CARB and EPA approved installers of conversion systems can retrofit a vehicle without compromising safety or vehicle performance. Case studies show that municipal fleets, such as transit buses, school buses, and refuse trucks, are well-suited for CNG vehicles because they drive circular routes that enable fueling at the same station. In areas that have limited alternative fueling stations, natural gas dispensers can be installed at fueling facilities as easily as conventional fuel tanks and at a similar cost. Prices of natural gas will evolve with more efficient production and vehicle demands.

Natural Gas Advantages

As with all alternative fuels, there are advantages and things to consider when converting fleets to use natural gas.[6]

Advantages

- Reduced greenhouse gas emissions and particulate matter when compared to conventional fuels
- Long-term cost effectiveness based on reduced operating costs
- Nearly all U.S. natural gas is domestically produced.
- Can be used with higher compression ratio engines for increased engine efficiency
- Less expensive when compared to conventional fuel prices

Things to Consider

- The initial investment for natural gas vehicle conversion or purchase
- Shorter driving range based on volume of onboard fuel
- Fewer public fueling stations when compared to conventional fuels
- Limited number of available vehicles

Natural Gas Performance and Safety

Major considerations in the successful application of alternative fuels are performance and safety. Using alternative fuels in fleets should not sacrifice operating performance and should provide a safe alternative to conventional fuel.

Performance

As mentioned in previous lessons, natural gas can help meet environmental and energy security needs. Minor differences have been noted in the performance of NGVs. Decreased driving range and cargo space are the main performance limitations. NGVs have similar acceleration and horsepower when compared to conventional fuel vehicles. Older natural gas vehicle conversions may have lower horsepower depending on conversion system; however, newer natural gas vehicle conversions may be just as efficient.

Larger volume fuel systems may limit the cargo and storage area of CNG or LNG fueled vehicles. A trade-off must be made between driving range and consumer acceptability for cargo room. As range increases, larger spaces are needed for fuel storage tanks.

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Engines that are specifically designed for dedicated natural gas use are more efficient based on increased compression ratio. The compression ratio of an engine is directly related to the engine's efficiency. Engines with higher compression ratios require the use of fuels with higher octane numbers. The octane number of methane is 120. Such an octane rating would allow for the design and use of engines with higher compression ratios. This would increase engine efficiency as compared to gasoline engines that currently use gasoline with octane ratings of 87-93.

Vehicle fueling is another point to consider related to performance and acceptance by consumers is vehicle fueling. At fast-fill stations, consumers can fuel in about five to seven minutes. For larger fleets, time-fill stations are available where multiple vehicles can be connected for overnight fueling, which takes four to eight hours. Most states have public fueling stations, but their location may not be adequate for extended range driving.

Natural Gas Performance Summary

- *Similar vehicle performance to conventional vehicles*
- *Higher octane rating*
- *Cleaner exhaust emissions than conventional vehicles*
- *Fuel tank size can be large*
- *Limited vehicle fueling stations*

Safety

NGVs have an excellent safety record for two reasons: the integrity of the NGVs fuel storage and delivery system and the properties of the fuel itself. Federal safety standards for NGVs specify requirements for the integrity of vehicle fuel storage and delivery systems using CNG—including the CNG fuel systems of bi-fuel and dedicated CNG vehicles. Like conventional fuels, natural gas is not without its risks. Natural gas, however, can be handled safely with regular fuel tank inspections.

CNG Cylinder Tank Inspection

New original equipment manufacturers (OEMs) for CNG vehicles are subjected to the same federal government crash tests as other vehicles and must meet Federal Motor Vehicle Safety Standards (FMVSS) 303 and 304.

FMVSS 304 standard requires inspection of CNG cylinders every three years or 36,000 miles, whichever comes first. The purpose of this is to reduce the risk of fires that can result from fuel leakage during and after vehicle crashes. This standard applies to containers designed to store CNG as engine fuel onboard any vehicle.

LNG Cylinder Tank Inspection

LNG storage tanks must meet standards for design reliability and operational performance. Storage tanks should undergo regular maintenance and thorough inspection periodically for corrosion.

The National Fire Protection Association (NFPA) requires that tank information be permanently marked on the dewar itself. This code shall apply to the design, installation, operation, and maintenance of LNG engine fuel systems on vehicles of all types, to their associated fueling (dispensing) facilities, and to facilities with LNG storage in ASME containers of 70,000 gal (265 m^3) or less.

This information is stamped on the outside of the neck ring or on the cylinder body itself. In some cases, the information is stamped on a metal plate and the plate is attached to the cylinder (see **Figure 7**). The marking is the identification card for the tank. This information can easily be used to distinguish between the different types of cylinders. Information provided includes the model, serial number, date of manufacture, working pressure, design temperature, gross volume, net volume, tare weight, material of construction, and maximum hold time.

Figure 7: *Example of LNG tank label. Source: NAFTC.*

The NFPA has a standard hazard placard to identify natural gas at stationary facilities. The NFPA 704 hazard placard used for CNG is shown in **Figure 8**. The "4" shown in the red area indicates that the flash point is below 73°F (23°C). The "1" shown in the blue indicates that compressed natural gas may cause slight to moderate irritation, and the "0" shown in the yellow area indicates that compressed natural gas poses no reactivity hazards.

Notes

Figure 8: *NFPA 704 hazard placard for CNG. Source: NFPA.*

Figure 9: *NFPA 704 hazard placard for LNG. Source: NFPA.*

The NFPA 704 hazard placard used for LNG is shown in **Figure 9**. The "4" shown in the red area indicates that the flash point is below 73°F (23°C). The "2" shown in the blue indicates that LNG is hazardous and may cause frostbite and asphyxiation, and the "0" shown in yellow area indicates that LNG poses no reactivity hazards.

Placards and/or other markings are required on bulk shipments to recognize the material and respond appropriately in the event of an emergency. Both CNG and LNG have their own transport placard issued by the U.S. Department of Transportation (DOT). CNG in transit must display hazardous material description identification number UN 1971 (see **Figure 10**); while LNG in transit must display the hazardous material description identification number UN 1972 (see **Figure 11**).

Figure 10: *CNG transport placard UN 1971. Source: DOT.*

Figure 11: *LNG transport placard UN 1972. Source: DOT.*

Natural Gas Safety Summary

- *NGVs must meet stringent safety codes*
- *Safe and durable storage tanks*
- *Tank inspections required*

Summary

This material develops an understanding of natural gas as an alternative fueling option for fleet managers and explains how to green fleets with natural gas and incentives to implement its use. Additional analysis describes the cost, advantages, performance, and safety of using natural gas. Natural gas vehicles are currently available for light-duty fleet applications in the forms of passenger cars, cargo vans, and trucks. Natural gas conversions and dual-fuel engines are available for heavy-duty applications and continue to gain popularity. Natural gas vehicles offer similar performance and better emissions compared to conventionally fueled vehicles. Natural gas as a vehicle fuel is available for storage as compressed natural gas (CNG) and as liquefied natural gas (LNG). Before fleet conversion, determination of what type of NGV should be investigated on specific fleet operations and local fueling options. Emissions certified conversions are available for both light-duty and heavy-duty fleet vehicles.

Test Your Knowledge

1) **True or False:** The price of natural gas based on a gasoline gallon equivalent (GGE) is typically lower than gasoline.

2) What are the two forms of natural gas storage?

3) **True or False:** Fueling stations for natural gas are located in nearly all locations of conventional fuel stations.

4) Natural gas engines can utilize higher _____ due to its higher _____ rating.

5) **True or False:** Natural gas vehicles require periodic fuel tank inspections.

Answers: 1) True; 2) CNG-compressed natural gas, LNG-liquefied natural gas; 3) False — although natural gas pipelines are nationwide, publicly available fueling stations for vehicles are limited.; 4) Compression ratios, Octane; 5) True.

Resources

Congestion Mitigation and Air Quality Improvement Program

The Congestion Mitigation Program was established in 1991. Since its inception, it has funded hundreds of millions of dollars worth of alternative fuel investments. The main goal of the program is to help communities meet or maintain federal air quality standards. Funding is available for all alternative fuels and is allowed for both public and private partnerships. Grants from this program can pay for the incremental cost of purchasing natural gas vehicles and can be used to fund alternative fuel infrastructure projects, although they must have 20% local or regional matching funds.

Learn More at:
http://www.ngvc.org/incentives/federalNGV.html

- **Alternative Fuels Data Center** – Natural Gas (http://www.afdc.energy.gov/afdc/fuels/natural_gas.html) – Offers publications about the use of natural gas as a fuel, a station locator, and other helpful information about the fuel.
- **American Petroleum Institute** (http://api.org/) – Provides natural gas information, statistics, and industry statistics along with other resources.
- **Clean Cities 2012 Vehicle Buyer's Guide** (http://www.afdc.energy.gov/afdc/pdfs/51785.pdf) – Offers model-specific information about vehicles that utilize alternative fuels.
- **Clean Vehicle Education Foundation** (http://cleanvehicle.org/) – Includes information about natural gas vehicles and upcoming events related to natural gas vehicles.
- **CNG Now!** (http://www.cngnow.com/Pages/information.aspx) – Discusses current topics surrounding CNG vehicles including fueling, infrastructure, and news events.
- **Fuel Economy** (http://fueleconomy.gov) – Official U.S. government source for information pertaining to the fuel economy ratings and fuel efficiency.
- **Gas Technology Institute** (http://www.gastechnology.org/) – Presents the organization's findings in relation to advanced natural gas technologies.
- **Natural Gas Intelligence** (http://intelligencepress.com/) – Allows users to browse through up-to-date natural gas headlines.
- **Natural Gas Supply Association** (http://www.ngsa.org/) – Offers information about a collection of natural gas suppliers that offer natural gas in the U.S.
- **Natural Gas Vehicles for America** (http://www.ngvc.org/) – Includes information, resources, and tool related to the expanded use of natural gas vehicles in the U.S.
- **NGV America** (http://ngvamerica.org/) – Provides information about the growing natural gas marketplace by listing manufacturers, providers, and other industry professionals.
- **U.S. Department of Energy – Biomass Program** (http://www1.eere.energy.gov/biomass/) – Includes information about using biomass to produce alternative fuels.
- **U.S. Department of Energy – Clean Cities Program** (http://www1.eere.energy.gov/cleancities/) – Addresses the nation's energy security by supporting local actions and groups to reduce overall petroleum consumption in transportation.

- **U.S. Department of Energy (DOE)** (http://energy.gov/) – Agency that helps ensure America's security and prosperity by addressing energy related problems with emerging technologies.
- **U.S. Department of Energy (DOE) Vehicle Technologies Program** (http://www1.eere.energy.gov/vehiclesandfuels/) – Develops more efficient transportation technologies that help reduce domestic dependence on foreign petroleum.
- **U.S. Environmental Protection Agency (EPA)** (http://www.epa.gov/) – Agency that acts to protect public health and the environment by writing and enforcing pertinent legislation.

Footnotes

1 Environmental Defense Fund, "Greening Fleets, A Roadmap to Lower Costs and Cleaner Corporate Fleets," http://business.edf.org/sites/business.edf.org/files/greening-fleets.pdf.

2 Natural Gas Vehicles for America, Incentives, http://www.ngvc.org/incentives/index.html; Argonne National Laboratory, Energy Systems Division, "Natural Gas Vehicles: Status, Barriers, and Opportunities" (August 2010), http://www.afdc.energy.gov/afdc/pdfs/anl_esd_10-4.pdf.

3 U.S. Department of Energy, Alternative Fuels Data Center, State Incentives and Laws, www.afdc.energy.gov/afdc/laws/state, (updated June 15, 2011).

4 California Energy Center, Consumer Energy Center, Compressed Natural Gas (CNG) as a Transportation Fuel, http://www.consumerenergycenter.org/transportation/afvs/cng.html.

5 U.S. Department of Energy, Alternative Fuels Data Center, Clean Cities Alternative Fuel Price Report (January 2012), http://www.afdc.energy.gov/afdc/pdfs/afpr_jan_12.pdf.

6 Johnson, C. "Business Case for Compressed Natural Gas in Municipal Fleets," Technical Report NREL/TP-7A2-47919, National Renewable Energy Laboratory (June 2010) http://www.afdc.energy.gov/afdc/pdfs/47919.pdf.

Notes

CASE STUDY

Location: Pittsburgh, PA
Company: Giant Eagle
Study: Natural Gas

With locations in Pennsylvania, Ohio, West Virginia, and Maryland; Pittsburgh-based, multi-format food and fuel retailer Giant Eagle is committed to environmental sustainability. The company strives to reduce and remove nonrenewable resources and waste, recycle the waste it creates, and seek energy-saving alternatives.

This "green" approach carries across all areas of the corporation — from promoting reusable grocery bags to using non-ozone depleting refrigerants in refrigeration systems. One of Giant Eagle's latest sustainability efforts comes in the form of compressed natural gas (CNG) vehicles.

Decision Points

In 2010, Giant Eagle's distribution unit, Talon Logistics, received an Alternative Fuels Incentive Grant from the State of Pennsylvania. The $900,000 grant, combined with an investment from the company, allowed for the purchase of 10 CNG-powered Volvo tractors and the installation of a public CNG fueling station as well as a private one for the company's fleet.

Photo courtesy of NAFTC.

Before the trucks ever arrived on Giant Eagle's property Vice President of Logistics Bill Parry began preparing his technicians for the transition to CNG. Through the company's active role as a Pittsburgh Region Clean Cities(PRCC) Coalition stakeholder, Parry became familiar with the National Alternative Fuels Training Consortium (NAFTC), a program of West Virginia University. Giant Eagle's automotive technicians attended two natural gas vehicle courses at the NAFTC headquarters in Morgantown, West Virginia, in preparation.

"The classes at the NAFTC were key," Parry noted while emphasizing the importance of education. "We prepared by doing a great deal of research. One of our biggest successes involved starting a focus group with a few key team members. We talked about everything that had to do with the project and addressed a lot of good questions."

Parry also characterized Giant Eagle as a trailblazer in converting a heavy-duty fleet to CNG. "Being an industry leader, there were a lot of stones that we turned over," he noted. "There were a lot of challenges involved. We worked hard to bring together the proper parties – contractors, technicians, and team members."

Fleet Facts

Giant Eagle's total fleet consists of 10 CNG trucks and one CNG car.

According to information from Volvo Trucks, each CNG Volvo VNM daycab is powered by an 8.9-liter, 320-horsepower, 1,000-pound torque Cummins Westport ISL G engine.

CNG is sold in gasoline gallon equivalents (GGEs), with every GGE having the same energy content as a gallon of gasoline. Parry reported that each Volvo VNM daycab's tank holds 84 GGEs of CNG and achieves about the same four to six miles per gallon as a diesel truck.

Fuel Supply and Infrastructure

Pittsburgh-based Equitable Gas supplied the CNG, pumping it into Giant Eagle's infrastructure. Equitable Gas, a subsidiary of EQT Corporation made a great partner Parry said, because the company also had installed a CNG fueling station and is in the process of converting its service trucks to run on CNG.

Photos courtesy of Giant Eagle.

Giant Eagle's private CNG station at its Beechnut Drive retail support and distribution center in the Pittsburgh area is sufficient to meet all of the fleet's fueling needs.

Giant Eagle's fleet is regional with trucks going out in the morning and coming back at night and fueling can be done as needed.

Parry added Giant Eagle designed the CNG station to mirror the same experience a driver would have at a gasoline station. The fast-fill CNG dispensers at Giant Eagle's stations fuel the vehicle in about six to eight minutes.

Costs

Parry explained that CNG trucks operate at about one-third the cost of diesel fuel counterparts. Currently, CNG is about $2-2.10 per GGE, while diesel is approximately $4 per gallon.

Giant Eagle also sees the expansion as an opportunity to support Pennsylvania's in-state natural gas industry. The supply of natural gas is growing, which allows for more predictability than diesel.

Each CNG tractor does come with a higher price tag than its diesel counterpart – though Giant Eagle expects to recover the difference in less than two years.

Photo courtesy of Giant Eagle.

Maintenance and Satisfaction

Because Giant Eagle took delivery of its Volvo CNG tractors during summer 2011, there is little to report when it comes to maintenance. Parry noted the CNG tractors came with warranties, just like any new vehicle would. No repairs have been necessary yet.

The maintenance technicians conduct preventive maintenance on the manufacturer's recommended schedule. Parry said he expects the time spent on CNG tractor maintenance to be about the same as on the diesel vehicles.

Overall, Parry reported he and his team have been satisfied with the CNG tractors when it comes to range, fuel economy, CNG prices, safety, and performance.

"All of our expectations have been met or exceeded," Parry commented. "It's only going to get better from here. Manufacturers will build more powerful motors and offer better onboard fuel storage options."

Photos courtesy of Giant Eagle.

Summary

According to data from the International Association for Natural Gas Vehicles, CNG reduces particulate matter emissions by an estimated 94 percent, carbon monoxide emissions by 75 percent, oxides of nitrogen emissions by up to 49 percent, and carbon dioxide emissions by 24 percent versus diesel.

"This project delivers improved air quality for the region through emissions reductions, reduces dependence on traditional fuels, and serves as a regional catalyst for southwestern Pennsylvania in adopting and understanding alternative fuels and clean transportation technology," Parry said.

In addition to the environmental benefits, commercial CNG vehicles run 50 percent quieter than diesel trucks. Giant Eagle's 10 CNG tractors are on track to displace more than 100,000 gallons of diesel fuel during the fleet station's first year of operation alone.

"The CNG project is an extension of Giant Eagle's corporate culture," Parry added. "It's part of our statement of values to be a good corporate citizen, to be environmentally responsible. We do whatever we can to make our business less demanding of the environment. I think our customers look at that and realize there's value in buying from a 'green' company."

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