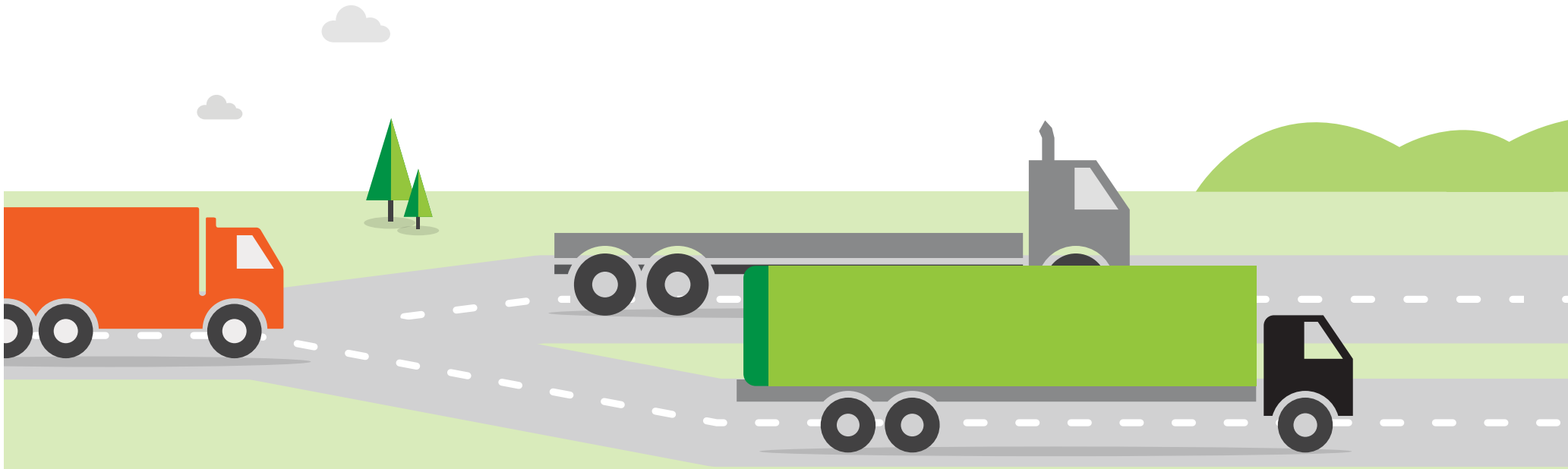


Greener, Safer, Cheaper



A Fleet Leader's Guide to the Processes, Expectations and Advantages of Switching to Compressed Natural Gas (CNG) Fuel



CNG: Why Now?

A Unique Opportunity for Short- and Long-Term Benefits

Compressed Natural Gas (CNG) is quickly becoming the fleet fuel of choice for smart companies of all sizes across multiple industries. In the next 10 years, U.S. businesses with light-duty and medium/heavy-duty vehicle fleets will double their natural gas consumption.¹

Advances in affordable CNG engine technology and an abundant supply of domestic natural gas have combined to create a unique opportunity for these businesses to upgrade their fleets and reduce costs, while also investing for future revenue growth.

Why? Because suppliers, customers and communities increasingly are requiring businesses to make greener choices, including reducing their fleet emissions. Whether the mandate is regulatory or market-driven, responding with an investment in CNG returns advantages in both the short and long terms.

Is your business ready to make the switch?

This guide will help answer that question by explaining the core infrastructure investment you would need to make outside of new trucks: the on-site CNG fueling station.



Compressed natural gas (CNG) is becoming the preferred fuel for commercial fleets.



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CNG: A Safe, Stable and Proven Fuel

Compressed natural gas (CNG) is a proven transportation fuel dating back to World War II. The 12 million CNG vehicles used around the world today² provide safe and convenient fleets to municipalities, retailers, consumer-goods distributors, delivery-service providers, construction companies, travel and leisure companies, colleges and universities, waste haulers and other organizations.

CNG is made by compressing natural gas to less than 1% of its volume at standard atmospheric pressure. Consisting mostly of methane, CNG is odorless,

colorless and tasteless. It is drawn from domestically drilled natural gas wells or in conjunction with crude oil production.

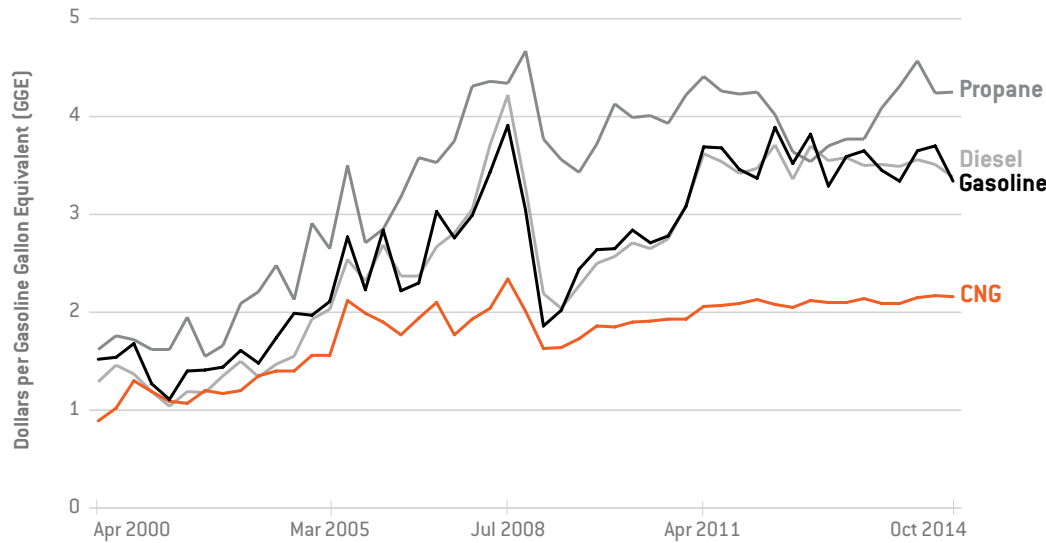
The price of petroleum-based transportation fuel is influenced by geopolitical events because so much comes from overseas sources. By contrast, the U.S. has its own abundant supply of natural gas, so the price of CNG is more stable.

CNG also is safer than liquid petroleum fuels both for users and the environment. Energy suppliers deliver natural gas through underground pipes to the

fueling station, where it is automatically converted and stored—ready to flow in familiar dispensing pumps as needed.

Gasoline and petroleum require more transportation time on trucks or ships from well to processing plant to fueling station, and then remain in a liquid form that can spill and splash. CNG cannot spill or splash, and in the rare event there is a leak while dispensing, the mostly-methane CNG evaporates into the air. Finally, CNG is naturally lower in emissions that have been deemed harmful to the environment and humans.³

Average Retail Fuel Prices in the U.S.






Source: U.S. Department of Energy, Alternative Fuels Center, www.afdc.energy.gov

CNG: A Cleaner-Burning Fuel

CNG engines emit less carbon dioxide than other common transportation fuels.

 **27% less CO² than**  diesel

 **26% less CO² than**  gasoline

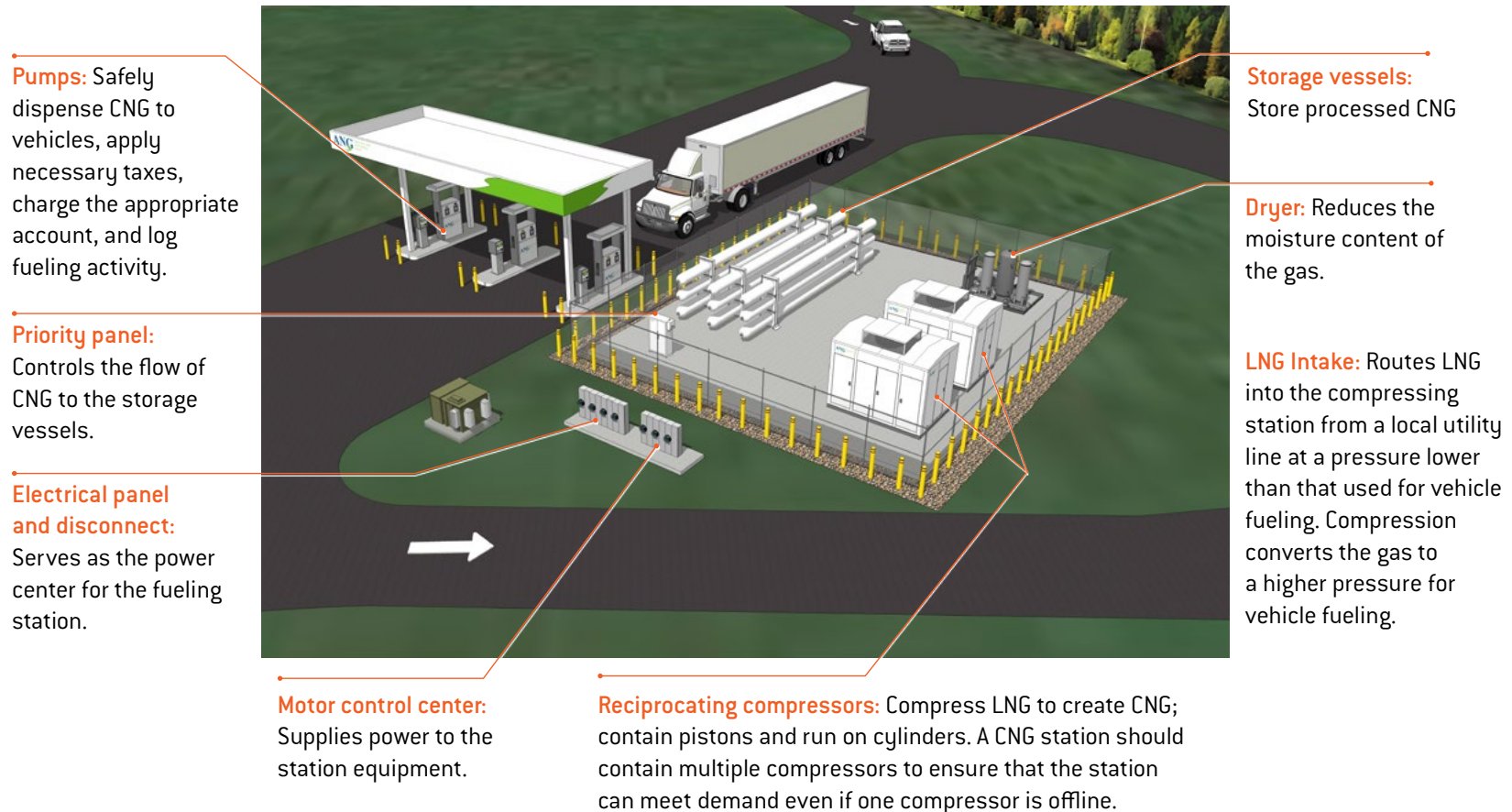
 **16% less CO² than**  propane

Source: CNG Now!, www.cngnow.com

The CNG Fueling Station: What You Need To Know

Construction of onsite CNG fueling stations is becoming more common to support the demand for CNG fleets. Each CNG station is customized according to business objectives, site specifications and limitations, average fuel consumption, and other factors; however, all stations have several key components in common. Below are major components for a station using liquid natural gas as fuel stock for CNG.

Anatomy of a CNG Station



The CNG Fueling Station: What You Need To Know

How Do CNG Stations Differ?

There are three types of CNG station structures that vary mainly by storage capacity, compressor(s) size and dispensing rate.⁴

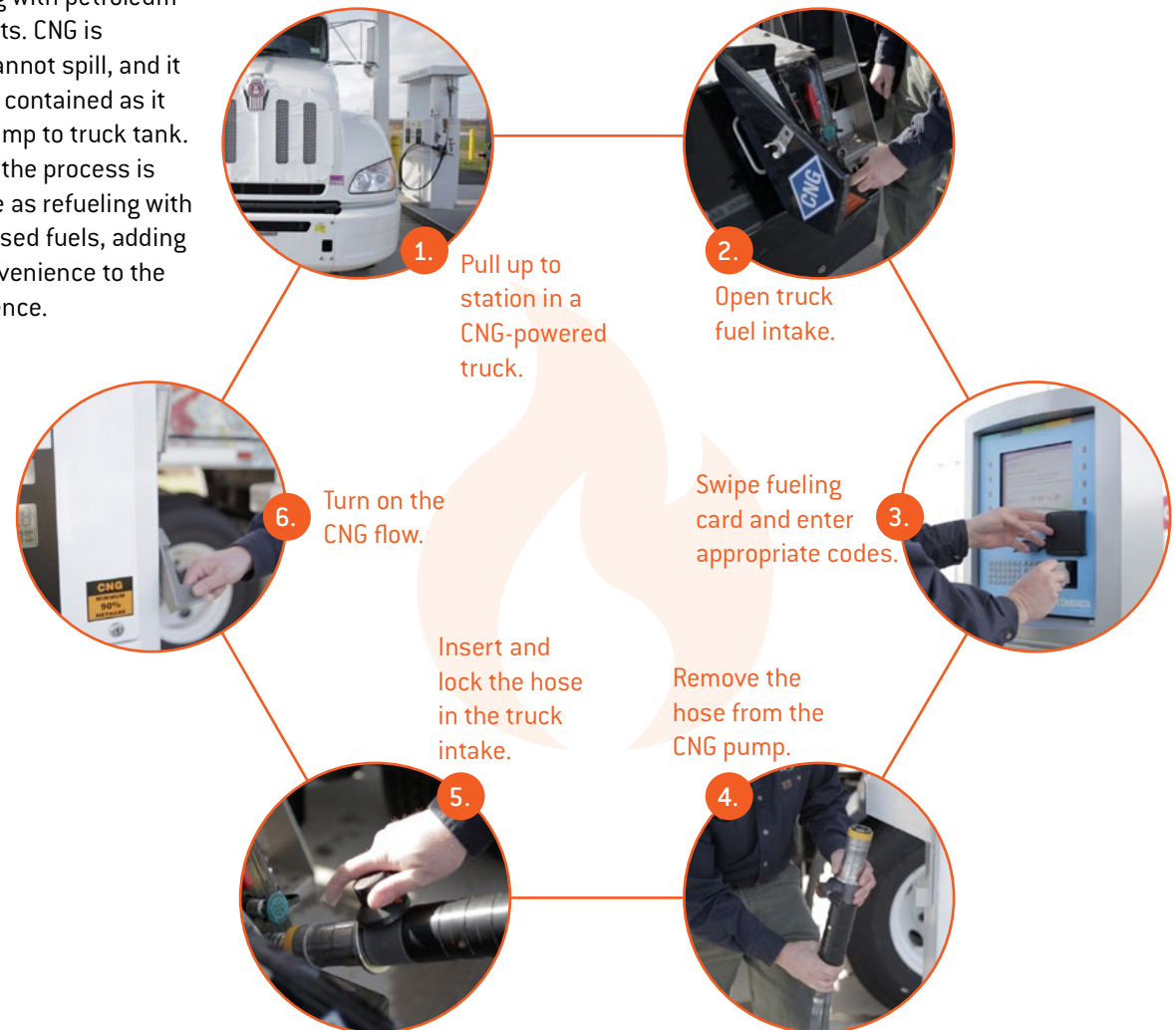
Fast-fill: Vehicle fill times are similar to those for gasoline or diesel fueling stations.

Time-fill: Businesses that want to fill their trucks during off hours at a central location use this type of station. How long the refilling process takes depends on the number of vehicles, the amount of fuel required, and the throughput of the compressor. Vehicles are unattended during the process, which could vary in time from minutes to hours.

Combination-fill: Fleet operators that want both of the above fueling options build combination-fill stations, where users have the ability to time-fill or fast-fill vehicles on demand. It is common for users to tap time-fill as the primary method of fueling, with fast-fill available as needed.

How Refueling Works: Step-By-Step

Refueling with CNG is safer than refueling with petroleum-based products. CNG is odorless, it cannot spill, and it is completely contained as it flows from pump to truck tank. Furthermore, the process is just as simple as refueling with petroleum-based fuels, adding ease and convenience to the driver experience.



The CNG Fueling Station: What You Need To Know

Who Will Use the CNG Station?

A CNG station may be accessible only to a private fleet, open to the public, or a combination of the two. The natural gas provider, station owner and (if applicable) station lessee would be party to an agreement on sharing revenue from public fueling.

A fleet owner might choose a public-private design to meet fuel supplier throughput requirements, to benefit from economies of scale, or to meet requirements of a grant or incentive. Some of the differences will affect costs. For example, public-access stations usually require liability insurance.



How Much CNG Will My Organization Consume?

To estimate your expected consumption, consider the following metrics⁵:

- Gallons of fuel consumed daily by vehicles that will be running on CNG. Use average fuel consumption for the fleet, not maximum tank capacity.
- Number of vehicles to be fueled per day, considering that CNG vehicles often carry less fuel than liquid-fueled vehicles and, therefore, may require more frequent fueling.
- Fueling patterns at the site. For example, do vehicles return to the yard for several hours a day or come only for fueling?
- Whether vehicles will be bi-fuel CNG/gasoline or dedicated CNG. This will affect the level of redundancy required in the CNG station.

Be sure to factor in your organization's overall growth objectives to determine projected consumption figures that correspond with business targets.

How Much Can I Expect To Save In Fuel Cost and Emissions?

A number of factors will affect the degree to which your organization will benefit from switching to CNG, in both the short and long term. Fuel prices, level of fuel consumption, and incentives are just some of the considerations at play. Take advantage of the following free calculators to help assess potential savings and carbon footprint reduction.

[American Natural Gas](#)

[CNG VICE Model 2.0 Calculator](#)

[GHG Emissions Calculator](#)

[Natural Gas Cost Calculator](#)

[Unit-Conversion Calculator](#)



The CNG Fueling Station: What You Need To Know

How Much Will a CNG Station Cost?

Cost for building the fueling station depends on a number of factors, including⁶:

- Fuel demand from the fleet and other users
- The fleet's applications and fueling cycles
- Site conditions
- The complexity of equipment installation
- The permitting processes

CNG equipment suppliers, CNG suppliers and design-build engineers can provide this information specifically for your organization, but the U.S. Department of Energy offers the following guide on costs for basic equipment:

Equipment Costs		
Equipment	Cost Range	Description
Compressor	\$4,000–\$550,000	The compressor takes inlet gas at low pressure and compresses it to the pressure necessary for filling a vehicle to 3,600 psi. The compressor's horsepower (HP) rating and the inlet pressure (psi) determine the flow rate, which is measured in standard cubic feet per minute (scfm) or gasoline gallon equivalent per hour (gge/hr). Compressors that offer similar flow rates vary in price based on their horsepower rating and manufacturer.
• 1–8 scfm (1–4 gge/hr)	\$4,000–\$22,000	
• 20–40 scfm (10–19 gge/hr)	\$50,000–\$90,000	
• 50–75 scfm (24–36 gge/hr)	\$80,000–\$150,000	
• 100–150 scfm (48–71 gge/hr)	\$100,000–\$250,000	
• 250–650 scfm (119–310 gge/hr)	\$200,000–\$550,000	
Dispenser	\$25,000–\$60,000	At fast-fill stations, drivers use a dispenser to quickly transfer CNG to the vehicle tank. Dispensers vary in cost depending on the number of hoses, fuel management system, and other features.
Dual-hose time-fill post	\$4,000–\$7,000	At time-fill stations, vehicles are connected to a simple fill post, typically overnight. The tanks are filled as fuel is available, which depends on the compressor flow rate and the number of vehicles. Two vehicles can connect to a dual-hose time-fill post.
Storage tank	\$70,000–\$130,000	Once natural gas is compressed, it can be stored in tanks for later use. The storage capacity and compressor size are balanced to ensure that fuel is available within the necessary timeframe and the number of times the compressor turns off and on is minimized.
Card reader/fuel management system	\$10,000–\$30,000	Card readers allow the driver to access fuel using a fleet card or credit card. A fuel management system is software that enables tracking of driver and vehicle fueling habits.
Gas dryer	\$10,000–\$300,000	A gas dryer removes moisture from the gas prior to compression, which is a good practice for all CNG stations.

The CNG Fueling Station: What You Need To Know

How Long Does Construction Take?

Building and commissioning a CNG station requires about three months, but there are key steps and variables throughout the process that can influence the timeline. These include:

1. Buying (if needed) land and general site work:

Prior to breaking ground on the station, the builder might need to perform general site work, such as grading, filling, compacting, paving and water management.

2. Regulatory and permitting: The lead time will vary based on the relevant governing bodies for the site, which may include fire marshals and zoning boards. Engaging authorities at the onset of the project will simplify—and potentially speed up—the permitting process.

3. Weather: In some locations, bad weather during construction can add to the construction timeline and construction cost. For example, during a period of heavy rainstorms, a project might be delayed and then incur additional cost for keeping water out of trenches.

Who Owns and Maintains the CNG Station?

Your organization can own the station and take responsibility for maintenance, liability and other operational requirements, or you can lease the station from a station provider.

If your organization opts to own the station, be sure to include operations and maintenance costs when evaluating ROI. These costs include electricity, insurance, technician time, equipment maintenance and upkeep, as well as the accounting software required to process the fuel purchase so that the appropriate taxes are applied.

Station owners should expect to provide regularly scheduled minor maintenance along with periodic major maintenance projects.



How Do I Find the Right Natural Gas Supply Products?

Select a provider with a variety of options so that you can choose an option that best fits your budget and needs. Examples of contract types include:

Fixed Price Product: Protects against the risk of natural gas price spikes. The rate remains the same for the length of the contract, although your monthly costs may fluctuate based on whether all your pricing components are fixed, and the volume of natural gas used.

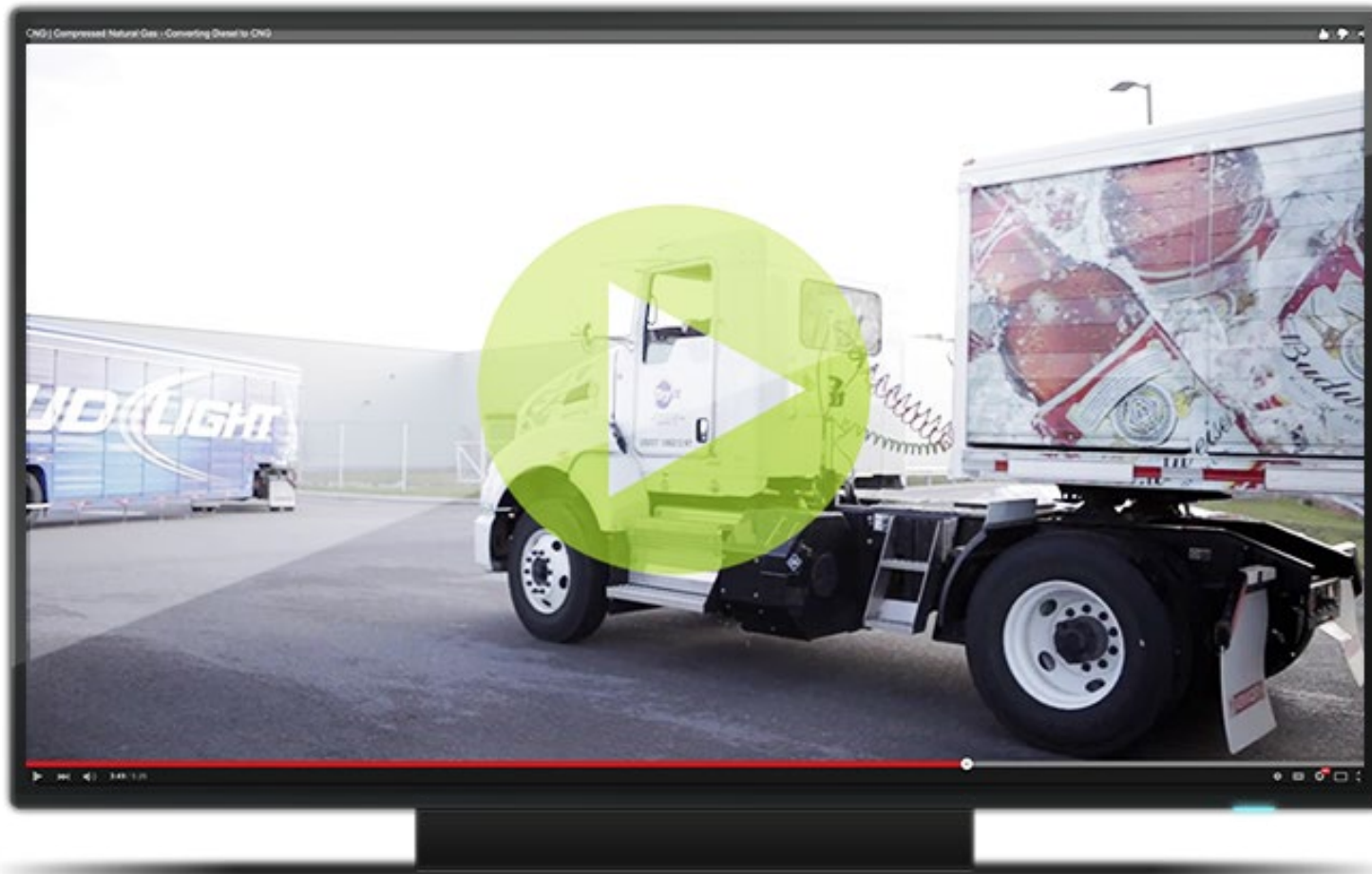
Variable Product: An index-priced natural gas product offers the flexibility to pursue competitive pricing—and potential savings—when market prices drop. However, an increase in market prices will expose your organization to budget risk.

NYMEX Plus Basis: Fixes your natural gas transportation costs—called the gas basis—while supply is purchased at prices settled monthly according to the market rate. This includes a trigger that locks in the remainder of your volume at a future date when prices hit your target.

Index with Cap: Caps the price of natural gas, while allowing you to take advantage of prices that fall below your maximum.

Case Study: Try-It! Distributing

Try-It! Distributing, a beverage distributor serving western NY, recently switched its 40-truck fleet from petroleum to CNG and commissioned construction of a private-public fueling station on its campus. The company expects to save 40% on fuel costs and be a more attractive choice for green-minded craft-beer brewers—a growing part of its beverage portfolio.



Planning Your Next Steps

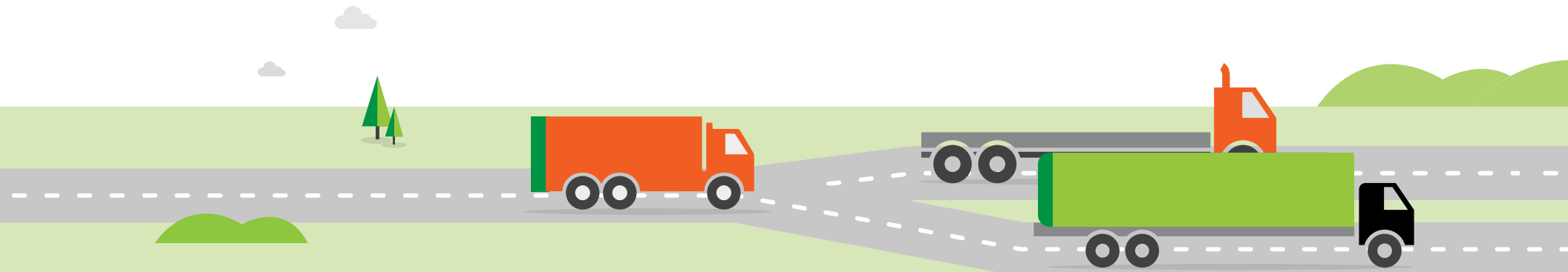
Is your business ready to invest in a greener, safer and cleaner fleet that also will help to meet customer, community and regulatory expectations for environmental protection?

If so, the next step is to plan a course of action. The decision and implementation processes can be complex and time-consuming for fleet leaders. You will need to assess the business case, choose suppliers, and work through the construction process for delivery pipelines, the compression station and fuel pumps—all while maintaining current fleet operations.

An alternative is to look for a partner with extended capabilities that can provide guidance, execution and ongoing support. Direct Energy Business is working with station design-build-and-operations provider American Natural Gas to offer a combined, streamlined approach to planning, building and supplying CNG fleet-fueling stations. This option

combines Direct Energy Business' expertise in natural gas supply, contract optimization and customer service with American Natural Gas' proven expertise in designing, building and maintaining CNG stations with superior uptime supported by exceptional maintenance.

To receive a complimentary consultation and learn more about the potential savings for your fleet, contact your Direct Energy Business Representative, email SolutionSales@directenergy.com or call 888.223.1524.



Glossary of CNG Terms

Btu (British Thermal Unit): The amount of energy required to raise the temperature of one pound of water by 1° Fahrenheit.

DGE (Diesel Gallon Equivalent): The amount of CNG containing the same energy content as one gallon of diesel.

GGE (Gasoline Gallon Equivalent): The amount of CNG containing the same energy content as one gallon of gasoline.

Inlet/Suction Pressure: The incoming pipeline gas pressure that supplies the CNG station. This pressure is a primary factor that determines the overall flow rate of a CNG station.

LNG (Liquefied Natural Gas): LNG is natural gas that has been cooled to -259° Fahrenheit (-161° Celsius) and condensed into a colorless, odorless, non-corrosive and non-toxic liquid.

Methane (CH₄): Commonly known as natural gas, methane is an abundant, colorless gas that burns efficiently with fewer byproducts than other fuel sources. As methane is naturally odorless, it has a distinctive odor added as a safety measure.

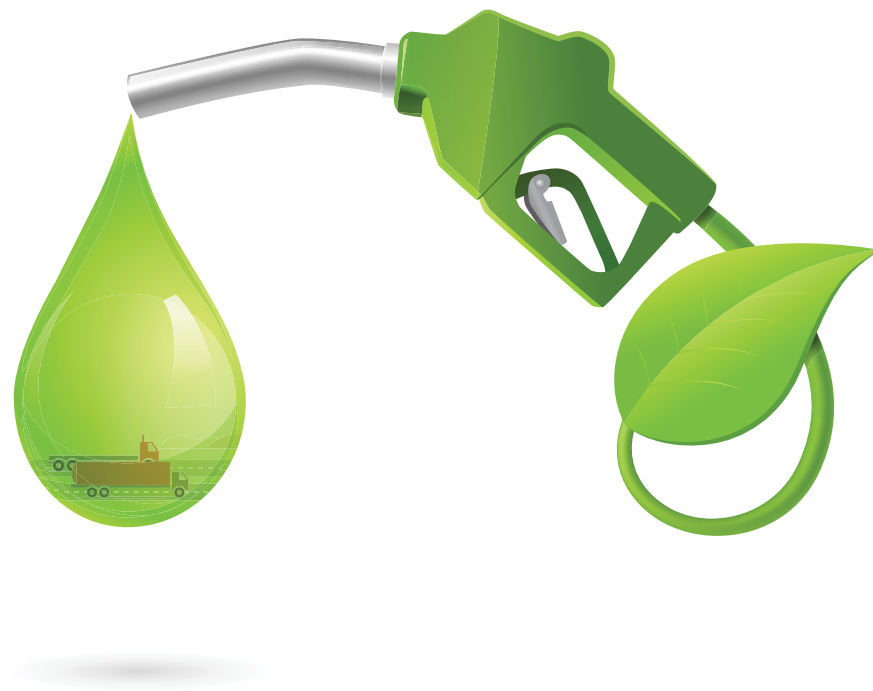
MMBtu: 1 Million Btu

PSI (Pounds per Square Inch): A measure of pressure relative to atmospheric pressure.

SCF (Standard Cubic Foot): Contains approximately 1,000 Btu

SCFM (Standard Cubic Feet per Minute): The standard measurement for the flow rate of gas. A CNG station with a flow rate of 125 SCFM equates to 1 GGE per minute.

Therm: 100,000 British thermal units (Btu). A common measure of gas as sold by utilities.



About Direct Energy Business

Direct Energy Business is part of the largest retail energy supplier in North America and a champion in serving businesses' diverse energy needs. Our leadership position, deep expertise and commitment to addressing our customers' unique energy demands is how we earn the trust of our customers and helped to make their businesses better.

With more than 25 years of industry experience, we are dedicated to helping companies make smart energy choices for their business. Contact us today to discuss your energy needs and we'll help you navigate the opportunities available in your service location(s).

Learn more about Direct Energy Business and other energy strategies for businesses and organizations of all types by visiting business.directenergy.com or call 888.925.9115.

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