

# FINDING THE SWEET SPOT

When it comes  
to alternative  
fuels, the right  
fit is everything

By Wendy Leavitt, director of editorial development

**E**very alternative fuel has its own sweet spot, says Darren Engle, director of government relations for Blue Star Gas. “[Although I work for a propane supplier], we are about promoting all alternative fuels and finding the one that works best for each fleet application.

“When the trucking industry chose gasoline and diesel back in the day, it did so because they had high energy content and were easy to deploy; you could carry them in a bucket,” he says. “Today, it is no longer one or two fuel choices for everybody. It is a little more complex than that now, but each choice, each option has something amazing to offer.”

Fleets have to come into the alternative fuel arena with their eyes wide open, observes Sean Turner, COO for Gladstein, Neandross & Associates (GNA), which helps fleets assess, design and implement clean fuel deployment projects and also organizes the annual Alternative Clean Transportation (ACT) Expo, which was held earlier this month in Dallas.

This is a must, he notes. The first step is to really understand how your existing vehicles get used every day. If you have a very heterogeneous fleet, as most operations do, then you are going to have to pick and choose where you use alternative fuels to hit the operational “sweet spot.”

The second step, of course, is to understand the costs. There has to be a sweet spot on the balance sheet, too.

“Fundamentally today, alternative power vehicles are going to have incremental costs and fleets have to find a way to repay those costs,” Turner says, “although most people believe the costs will eventually come down.” The vehicles themselves cost more now, and there may also be additional upfront costs related to building fueling stations and upfitting maintenance facilities. That means fleets have to save money somewhere else. That somewhere else is fuel.

Typically, alternative fuels cost less on a per gallon equivalent basis than diesel or gasoline, so the best alternative fuel choice from a financial perspective is the one that burns the most alternative fuel, he explains. For example, say you pay \$45,000 extra for a heavy-duty alternative power truck to replace an existing diesel truck, but the cost for the alternative fuel is \$1 less per gallon than diesel. That means your payoff period will be shorter if the new truck burns 20,000 gal. of alternative fuel a year than if it burns only 2,000 gal. of fuel.

In short, if you don’t run the alternative power vehicle enough, you just can’t pay yourself back; you can’t offset the higher upfront cost soon enough to make the switch worth

the investment, Turner says. This applies as well to hybrids and even to small passenger vehicles like a Prius.

A few fleets will pay more to operate “green vehicles,” to run domestically sourced fuels, or to hedge their bets against fuel market volatility, he adds. They want at least parity with their conventional power choices and reducing costs would be better. There is a lot of impetus in the last few years to save dollars and provide an environmental benefit.

Success with alternative power is about making sure that the sweet spot for a given alternative power choice overlaps as perfectly as possible with the demands of a job that has to be done. It is also about making sure that the business case is as neat a match as the performance profiles.

Happily, there is more and more information to help guide fleets through the alternative fuels decision-making process, from operational considerations to the bottom line. Here are a few sweet spot snapshots of the most readily available alternative fuels to help you on your way.

### PROPANE

In March, AmeriPride Services, one of the largest textile rental and supply companies in North America, announced that it was adding additional propane autogas trucks to its fleet. After testing five Roush CleanTech Ford F-59 delivery trucks in Kansas, the company announced plans to add 20 more in Northern California.

For AmeriPride, hitting the sweet spot involved installing a private autogas [propane] station with a 1,000-gal. tank at its facility in Topeka, KS. According to Roush, fueling infrastructure for propane is less expensive to install than any other alternative fuel due to fewer requirements from the Environmental Protection Agency (EPA).

When it comes to a fit on the cost side of the equation, AmeriPride reported that it is paying \$1.55 per gallon for propane autogas that has, historically, been about 50% less than diesel.

“Pickup trucks to UPS delivery vans are about where the sweet spot for propane autogas is today,” Engle says. Propane autogas is usually about \$1 to \$1.40 less per gallon than gasoline, although it is about 10% less energy dense. That means payback is typically about 24 months.

When it comes to range for dedicated, 100% propane vehicles, propane fuel tanks can generally hold enough for 200 to 280 mi. per tank, he notes, although tanks can be upsized if there is room on the chassis. Bi-fuel vehicles, which add a propane fuel system to a gasoline

## Natural Gas in the UPS Rolling Laboratory

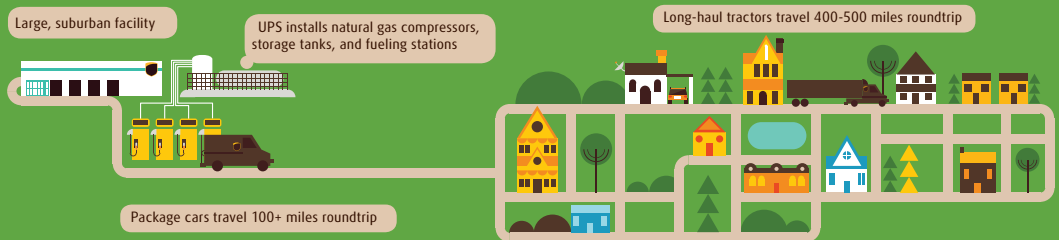
The UPS "Rolling Laboratory" strategy is to field-test new fuels and technologies in the UPS network, and then scale up the combinations of fuel source, facility location, vehicle type, delivery role, and infrastructure investment that

deliver the best ROI. We are now scaling up such optimum ROI combinations for liquefied natural gas (LNG), compressed natural gas (CNG), and liquefied petroleum gas (propane).

### LNG



### CNG



### Propane



To learn more, please visit [ups.com/sustainability](http://ups.com/sustainability)

UPS

vehicle rather than replacing it, can also run on gasoline to extend range. And engines like the high-octane propane. It produces less soot.

Additionally, according to the Propane Education Research Council (PERC), fuels like propane still qualify for federal and state fuel and infrastructure incentives, tax credits, rebates and benefits. And it does not require additional emissions technologies, such as diesel particulate filters and selective catalytic reduction (SCR) to meet EPA and California Air Resources Board (CARB) standards. It is also not restricted by anti-idling regulations.

According to Tucker Perkins, chief business development officer for PERC, about 25,000 mi. per year is ideal for propane autogas-powered trucks with a trade cycle of five years or more. "We thought a lot of fleets would take their eyes off the [alternative energy] ball when gas prices fell," he observes, "but that was not the case. Propane prices also fell, so the economic model did not change."

Today, Perkins notes, there are about 160,000 propane users in the U.S., "and most everybody likes it; most everybody who tries propane autogas stays with it."

"If all vehicles ran on propane," Engle observes, "you could not pencil out a case for switching to gasoline."

## COMPRESSED NATURAL GAS

Last month, UPS announced plans to build 15 compressed natural gas (CNG) fueling stations to support the

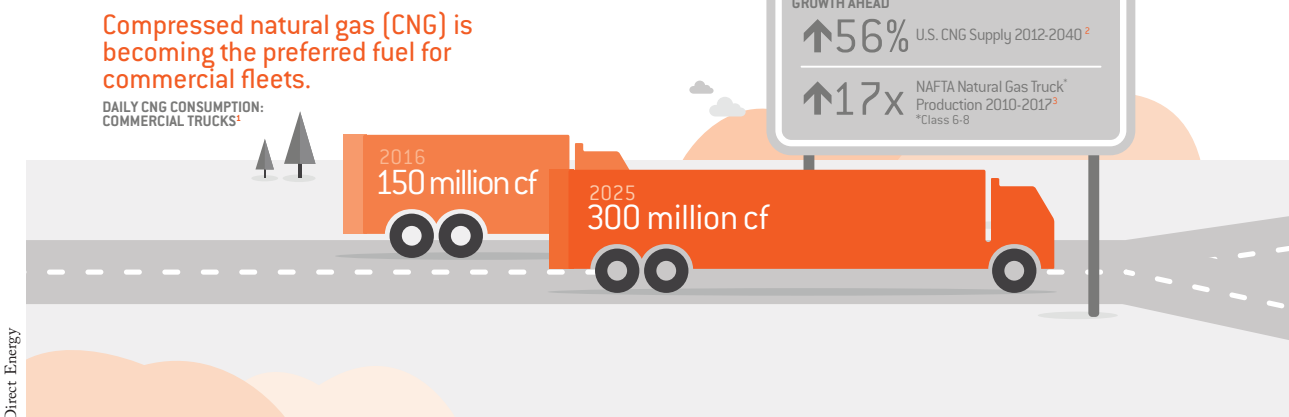
purchase and planned deployment of 1,400 new CNG vehicles over the next year. The company plans to deploy the CNG vehicles in 15 cities from Atlanta to California. "[This] CNG announcement demonstrates UPS's plans to expand use of widely available natural gas," noted Mitch Nichols, UPS senior vice president of transportation and engineering in April. "CNG is an important building block in our long-term fleet strategy and offers environmental and economic advantages."

UPS has become something of a poster child for alternative power deployment with its "Rolling Laboratory" approach to deploying a wide variety of alternative power options in its fleet to reduce emissions and dependence on fossil fuels while improving efficiency in the process. It operates one of the largest private alternative fuel and advanced technology fleets in the country using CNG, LNG, propane, hybrid electric, all-electric, hydraulic hybrid, and biomethane-powered vehicles, each deployed in its sweet spot application.

Anheuser-Busch (AB), *Fleet Owner's* Green Fleet of the Year for 2015, is another fleet that is making the move to natural gas. The company has begun converting trucks in its dedicated fleets (which are not AB-owned assets) to natural gas.

"The alternative fuel concept is one of a handful of things that we do at AB to help our fleets reduce emissions," noted William (Billy) Lawder, director of transportation engineer-

# READY TO ROLL



Direct Energy

Down the road, CNG use is projected to keep climbing.

## Propane Autogas vs. Natural Gas

A brief comparison of implementation costs and environmental impact

Both autogas and compressed natural gas (CNG) are American-made, abundant and less expensive than gasoline. But every dollar invested in autogas goes further for our environment and our energy security.

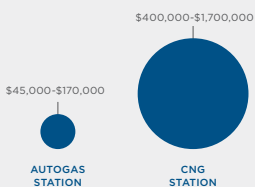
### AUTOGAS FUELING STATIONS ARE LESS EXPENSIVE

YOU CAN BUILD

15 AUTOGAS FUELING STATIONS FOR THE PRICE OF 1 CNG FUELING STATION

One CNG fueling station costs between \$400,000 and \$1,700,000. A comparable autogas station costs between \$45,000 and \$175,000.

COMPARE FUELING STATION COSTS



### AUTOGAS VEHICLES ARE LESS EXPENSIVE

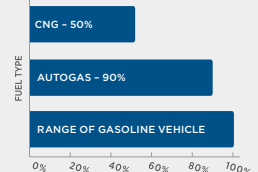
YOU CAN CONVERT

2 LIGHT-DUTY AUTOGAS VEHICLES FOR THE PRICE OF CONVERTING 1 LIGHT-DUTY VEHICLE TO CNG

An average CNG vehicle conversion costs \$15,000. An average autogas conversion costs \$8,000.

### AND GET BETTER RANGE

COMPARE VEHICLE RANGE BY FUEL



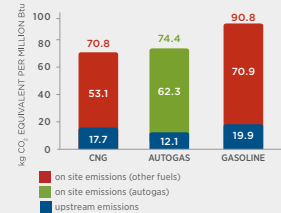
### AUTOGAS REDUCES MORE HARMFUL EMISSIONS PER DOLLAR INVESTED

PER DOLLAR INVESTED

AUTOGAS VEHICLES OFFSET 1.5X THE HARMFUL EMISSIONS THAT CNG VEHICLES OFFSET

Compared to gasoline, both autogas and CNG vehicles reduce harmful emissions by more than 20%. But per dollar spent, more autogas vehicles can be deployed, thereby offsetting more harmful emissions.

COMPARE CARBON EMISSIONS



Blue Star Gas

Source: U.S. Dept. of Energy, U.S. Energy Information Administration, and various third-party studies

ing for Anheuser-Busch, during a recent *Fleet Owner*/ACT webinar about natural gas sponsored by Ryder.

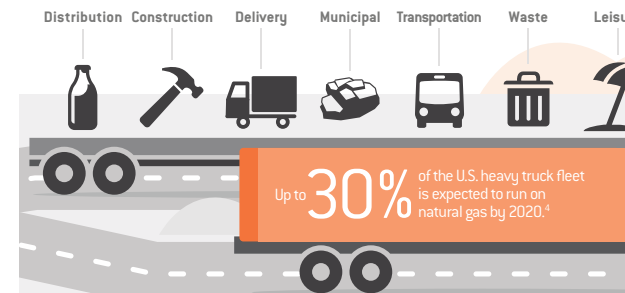
Like other fleets successfully deploying alternative power vehicles, AB's focus on natural gas vehicles involves both economic and operational considerations. And like other fleets, the decision centers on finding the sweet spot for operating natural gas trucks paired with the "dramatically lower" cost of natural gas fuel as compared to diesel to make the math pencil out.

For AB's Houston fleet conversion, for instance, the company calculated a 535-mi. loop route as an operational range with a buffer. If that did not cover all needs, it was necessary to consider adding second fueling stations or incremental tank sizes to make the operation of CNG trucks work.

For natural gas, tractors will cost 50% to 100% more, and maintenance costs for natural gas will be slightly higher, noted Lawder, but fuel costs will be dramatically lower. What AB looks at is not just the absolute price of fuel but the spread between diesel and natural gas, he said. AB also thinks of CNG not just as a cost savings but as part of a fuel diversification strategy.

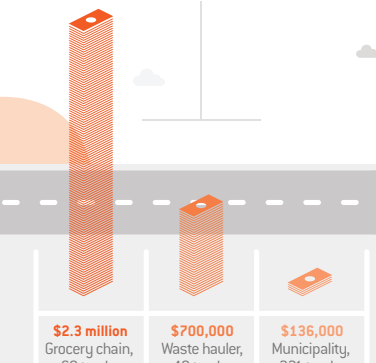
According to Lawder, another risk and an important consideration is what the price of a tractor will be in five years, after it has up to 800,000 mi. The residuals are fairly well-established for diesel engines but are less

Businesses in a broad range of industries are switching their fleets to CNG.



Why are they switching? The potential savings are compelling.

HOW MUCH ARE OTHER BUSINESSES SAVING ANNUALLY?<sup>5</sup>



known for CNG tractors, he observed during the webinar.

In addition to economic and operational considerations, AB also has marketing considerations. In creating a better world and a natural gas fleet, AB is using the terminology "Seed to Sip" and is marketing its natural gas fleet.

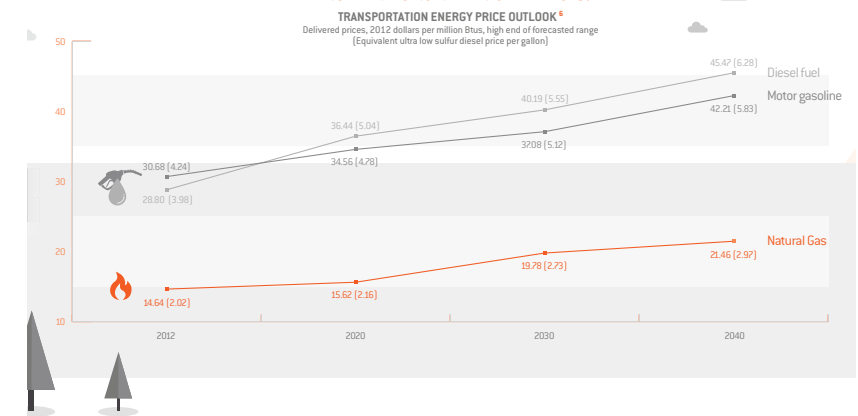
### LIQUEFIED NATURAL GAS

In March, Raven Transport announced that the company is expanding its natural gas fleet with 115 Peterbilt Model 579s, equipped with sleepers and powered by liquefied natural gas (LNG) to haul goods for a leading consumer packaged goods company. Clean Energy Fuels Corp. is supporting this move on the part of its long-time customer by opening four additional truck-accessible LNG fueling stations to the five already in the southeast and adding mobile fueling stations elsewhere to make LNG available throughout the region.

LNG contains 2.4 times more energy per diesel gallon equivalent than CNG does and has greater payload capacity and operating range, although the range for CNG vehicles has been pushed out in recent years with improved CNG storage and enhanced vehicle aerodynamics.

Since LNG is a liquid, refueling speed is also comparable to diesel or gasoline—a plus. However, because it is cryogenically liquefied to -260 deg. F,

Looking ahead, CNG is projected to be the cost-effective alternative to traditional fuels.



Source

- U.S. Energy Information Administration, 2014 Annual Energy Outlook
- U.S. Energy Information Administration, 2014 Annual Energy Outlook
- Frost & Sullivan, Strategic Outlook of the Global Medium-Heavy Commercial Truck Market for 2013
- New York Times, "Trucking Industry Is Set to Expand Its Use of Natural Gas," April 22, 2013
- Figures reported by American Natural Gas customers Colorado Energy Office, "Experiences with Compressed Natural Gas in Colorado Vehicle Fleets."
- U.S. Energy Information Administration, 2014 Annual Energy Outlook

drivers need to wear masks and gloves when fueling to avoid cryogenic burns, which is not required with CNG.

Maintenance facilities servicing either LNG or CNG vehicles must have designated NG shop bays that meet National Fire Protection Assn. Code 30A for Motor Fuel Dispensing Facilities and Repair Garages. Shop modification can be costly, too. According to Ryder, which operates a number of NG vehicle maintenance facilities and fueling stations, facility modifications

can run from \$250,000 to \$500,000—one reason many fleets using natural gas chose to outsource maintenance or even to lease their NG vehicles.

There are some good on-line tools to help fleets make the call between LNG and CNG, including a payback comparison calculator on the Clean Energy website.

### RENEWABLE NATURAL GAS

Renewable natural gas (RNG) is a newer name for methane or biometh-

ane, which is naturally produced by the decomposition of organic matter at places well off most folks' must-see "bucket lists," such as landfills and large-scale dairy operations. Left to drift into the atmosphere, methane is a potent greenhouse gas, but when treated and burned as a fuel, it emerges as a "clean" fuel source, producing some 90% fewer carbon emissions than diesel or gasoline, according to CARB, and at a price about \$1 less than diesel.

Clean Energy is today's primary supplier of renewable natural gas, according to the company, and California is the primary market, where 60 Clean Energy natural gas (CNG and LNG) fueling stations in the state pump biomethane exclusively.

When Clean Energy launched its "Redeem" biomethane product in 2013, it had three sources for biomethane. Today, there are more than 15 such sources—and demand is growing.

RNG can be used interchangeably with CNG or LNG, but its sweet spot is made sweeter still by its entirely renewable status (rewarded with low-carbon fuel credits) and its double benefit of removing methane from the atmosphere and putting a would-be air quality villain to good use instead.

## ALL-ELECTRIC POWER

Battery electric vehicles (BEVs) may be the most limited in range and configuration options of all the alternative power choices at present, but their zero-emissions status (with rewarding federal and state tax incentives) can make them a viable choice for operations such as local pickup and delivery or utility companies where operating ranges are low and dwell time is sufficient to enable charging.

According to Smith Electric Vehicles, a global producer of all-electric, medium-duty vehicles in use by companies like Frito-Lay and UPS, all-electric vehicles can cut operating costs by 70%. Not only do the trucks run on electricity versus a liquid fuel of any sort, but they are much simpler machines to maintain.

"There are over 1,000 moving parts in an internal combustion engine and four in an electric motor," Smith notes on its website. "With very few moving parts, the annual service and maintenance expense is much lower and the practical operating life is longer than conventional diesel trucks. The Smith vehicle maintenance regime is simple: two daily fluid level checks on the electric motor and cab heater, plus an annual check on the batteries. The vehicle's standard service schedule applies for everything else: running gear, brakes, suspension and steering components."

In a technical paper presented in 2012 at the EVS26 International Battery, Hybrid and Fuel Cell Electric Vehicle Symposium ("Using Commercial Electric Vehicles for Vehicle-to-Grid," Jasna Tomic and Jean-Baptiste Gallo), the authors acknowledged that "making a good business case for commercial electric vehicles (EVs) is not straightforward. The economic benefits of EVs are especially difficult to materialize when vehicles do not displace enough fuel and do not accrue enough maintenance savings through driving and work site operations."

They did, however, identify some sweet spots: "We found that EVs make a good business case in Class 4 urban driving applications when driven more than 60 mi. per day. In Class 5-6 utility-work site applications on military

## CAN YOUR ALTERNATIVE FUEL VEHICLE DO THE JOB?

**B**efore you can make a sound decision about adding alternative power vehicles to your fleet, you need to know exactly what they will have to do on a day-to-day basis. In other words, you have to know what your existing vehicles are actually doing in order to determine if an alternative power option under consideration can handle the job, says GNA's Sean Turner.

Answering questions like these before you move ahead can help you avoid costly oversights that could jeopardize your success with alternative power. If you have a diverse operation with several types and classes of vehicles and duty cycles, remember to consider each group of vehicles separately. An alternative power choice that is perfect for one subset of your entire fleet might not be perfect for all.

Once you answer each question for your current fleet(s), you should know what performance targets any alternative power options will have to hit in terms of things like range, fueling/charging, payload, and maintenance.

- ▶ What is the average length of haul now?
- ▶ What is the longest distance a vehicle travels in a day?
- ▶ How many hours per day are trucks actually running versus sitting at stops?
- ▶ Do trucks idle? Do they have to do so?
- ▶ Do they return back to a central terminal every day?
- ▶ How many consecutive hours are they parked every day?
- ▶ How much payload does each truck carry?
- ▶ Are there specific configuration requirements for cargo carried or body-mounted equipment?
- ▶ Where do the trucks presently fuel? Are there out-of-route miles to fuel? Will that have to change for your alternative power vehicles? Can that be accommodated easily?
- ▶ Where are your current vehicles maintained? Will that have to change in the case of alternative power vehicles?
- ▶ Are there any extremes of temperature or terrain along your lanes?

If the fit is right, calculating the ROI is the next step.

bases, EVs need to displace at least six gallons of diesel per day for the investment to be worthwhile."

"Using EVs for [vehicle-to-grid communications], specifically for frequency regulation, increases the EV battery uses and can dramatically improve the business case," they added.

"The fuels we have today are 'bridge technologies,'" Engle observes. "They will probably not be the perfect fuels for the future, [but they are a start]."

Like others in the alternative fuel space, Engle sees various financial incentives as "absolutely essential" to jump-start new power technologies in their early stages, although alternative power "can't be subsidized forever," he says.

"Less than one percent of vehicles in the United States run on alternative power now," Engle adds. That is a lot of upside potential. ■

