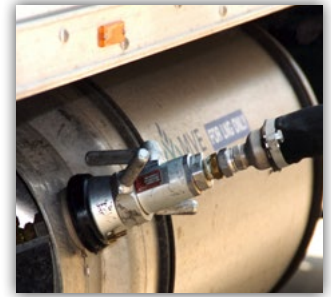


Applying the Energy Service Company Model to Advance Deployment of Fleet Natural Gas Vehicles and Fueling Infrastructure

June 2014



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■ EXECUTIVE SUMMARY

Alternative fuel vehicles (AFVs) are a small but increasingly important part of the U.S. transportation system. Powered by rechargeable batteries, natural gas, hydrogen, or other non-petroleum-based fuels, AFVs hold the potential to provide public benefits by reducing greenhouse gas emissions, enhancing energy security, and improving air quality. Despite progress, however, challenges continue to limit wide-scale deployment of AFVs and fueling infrastructure, including high upfront costs, risk aversion, information barriers, and discomfort with the complexity of large fleet conversion and infrastructure projects

While natural gas has not historically been used widely as an energy source for transportation in the United States, interest in the expanded use of natural gas as a fuel for cars and trucks has grown primarily as a result of the development of abundant, domestic natural gas supplies, which has reduced the fuel's price relative to gasoline and diesel. In addition to the prospect of fuel cost savings, NGVs also offer environmental benefits over gasoline and diesel vehicles, including reduced climate and air quality impacts. In some cases, heavy-duty NGVs may also be a lower cost compliance option with tightening emissions regulations compared to diesel alternatives. In addition, adoption of NGVs may offer "green" or energy security related marketing benefits.

Exploring how innovative service contracts that incorporate features of the Energy Service Company (ESCO) business model can help reduce the barriers to vehicle fleet investment in natural gas vehicles (NGVs) and fueling infrastructure, is the purpose of this paper. An ESCO is typically a business that develops, arranges financing for, and installs projects designed to improve the energy efficiency of and reduce maintenance costs for buildings, usually over a 7 to 20 year time period. The ESCO business model is promising because NGV deployment and building energy efficiency present a similar opportunity—energy cost savings—and face similar challenges of high upfront costs, risk aversion, and information barriers.

NGV projects, however, face some of their own unique challenges, and the traditional ESCO model as it has been applied in the building energy efficiency sector is not a perfect fit for NGV projects. Energy cost savings can

AFV Finance Initiative

C2ES, in partnership with NASEO and with funding from the U.S. Department of Energy's Clean Cities Program, began a two-year initiative in early 2013 to develop innovative finance mechanisms aimed at accelerating the deployment of AFVs and fueling infrastructure. More information is available at:

www.c2es.org/initiatives/alternative-fuel-vehicle-finance

be more difficult to guarantee for NGV projects because they stem from differences in fuel prices (or "price spreads"), not reductions in fuel use, and because the energy performance of vehicles is harder to predict than buildings. In addition, upfront investments, particularly fueling station costs, can be challenging to recoup without sufficient early demand for fuel. Nevertheless, many features of the ESCO model can be adapted to address these challenges.

While the market will ultimately determine what combinations of services are most effective, lessons from early pilot projects and initiatives can help identify which services are most promising and guide the exploration of new business models. This paper (1) summarizes the opportunities and experience to date applying the ESCO model to NGVs and fueling infrastructure projects; (2) presents recommendations for companies and policymakers to help address identified barriers; and (3) lays out next steps for this project.

KEY INSIGHTS

Turnkey solutions will be particularly valuable to some clients, while others will desire cheaper, more limited services. Fleet operators will demand differing levels of support as they undertake NGV investments depending on how tightly they wish to incorporate NGVs into their operations as well as their level of experience with alternative fuels, their appetite for risk, and their access to capital. Some clients will require turnkey, off-balance-sheet solutions, so that operational savings can be realized from the project's outset in order to minimize risk as well as the need to raise capital. Other clients, particularly

those who perceive strong value in NGV ownership, will desire greater control of project financing, operations, and asset ownership; although such clients may seek help with project evaluation and transition tasks. The needs of many fleet operators will lie between these cases, with contracts addressing specific needs such as tax equity partnerships, vehicle or station technology performance guarantees, asset insurance, operations assistance, and other services.

Public and institutional sector fleets may present a significant opportunity for deploying ESCO-like services built around performance contracting. Government, university, school, and hospital clients accounted for more than 85% of ESCO revenues in 2011. Just as in the building energy efficiency sector, government and institutional fleet projects are likely to make up the majority of the demand for ESCO services because, compared with commercial fleets, they have a higher tolerance for projects with longer payback periods, reduced focus on maximizing investment return, and the ability of ESCO services to help overcome bureaucratic hurdles. Government and institutional clients are also already familiar and comfortable with the ESCO model, and financial institutions are familiar with applications of the ESCO model in these sectors.

In the future, widespread access to public alternative fuel refueling stations will likely change the services demanded by fleets. The high upfront cost of installing fueling stations presents a significant barrier for most fleet NGV deployment, especially for commercial fleets, because including a station in the project extends payback substantially. As more fleets become interested in NGV deployment, inter-fleet agreements could be forged to share stations, reducing upfront project costs for all project participants. Further down the road, as publicly available stations become more available, the financial prospect of fleet NGV deployment will strengthen, significantly increasing demand for NGVs and paring back the services required by fleet operators to deploy these vehicles.

RECOMMENDATIONS FOR COMPANIES AND POLICYMAKERS

Energy service providers should continue to develop innovative, diverse services to overcome barriers to commercial fleet NGV investment. Traditional ESCOs

have had limited success in the commercial building energy efficiency markets and may or may not be similarly challenged to make an impact in the commercial vehicle fleet markets. The application of the ESCO model to both building and vehicle projects is hampered by the fact that performance contracting tends to work best for projects with longer payback periods, while commercial entities prefer investments with shorter payback periods. On the other hand, fleet NGV projects may not be encumbered by some of the barriers that have limited the success of ESCOs in commercial building energy efficiency markets, such as “split incentives” and asset ownership by limited liability companies (LLCs) with high risk of default. Energy service providers can establish themselves in the growing NGV services market by offering tailored services that address the specific barriers to commercial fleet NGV deployment. Some private sector fleets are starting to see a strong value proposition in NGVs, and as a result prefer to finance and own the vehicles themselves. Other commercial fleets may perceive investment as more risky, or they may have limited access to capital and thus need to realize savings from the project’s outset. Some companies may need to keep NGV projects on their operating budget to avoid unfavorable comparisons with other more profitable investment opportunities. Most commercial fleets continue to face information barriers and will have need for education, upfront evaluation, and technology transition services. Continued innovation from energy service providers could help overcome all of these barriers.

Companies should forge new partnerships to provide innovative, one-stop services to advance fleet NGV deployment. The expertise and resources required to execute an NGV fleet project are broad and distributed across many business types including vehicle and station equipment manufacturers, vehicle leasing companies, fueling station service providers, fuel suppliers, engineering firms, ESCOs, energy consulting firms, banks, state energy offices, and Clean Cities Coalitions. Formal or informal partnerships among diverse companies that provide complementary services could efficiently provide the needed project assistance for fleet operators.

As ESCOs gain more experience working with vehicle fleets, NGV projects can be advanced by more tightly integrating them into project portfolios. Including NGV projects in facility-wide ESCO portfolios from the outset can allow these projects, which tend to be on the riskier

and lower return end of the spectrum, to be “subsidized” by more familiar, less risky, higher return investments. Furthermore, the financial and environmental value of NGV projects may also be enhanced by complementary projects in an ESCO portfolio, such as renewable energy generation.

In some states, legal barriers prohibit applying ESCO models to fleet projects in the public sector, which can be addressed with policy changes. Some laws governing public procurement and the structure of competitive solicitations for goods and services can make some contracts, even ones that would save public agencies money, explicitly illegal. While many states are presently allowed to enter into ESCO contracts in order to make energy efficiency investments for public facilities, some of these states are unable to include NGV projects in ESCO contracts because these projects reduce energy costs

rather than energy use. These states may require legislative changes to enable agencies to include vehicle projects. For example, new state legislation in Colorado signed into law in June 2013 expanded the state’s utility cost-savings measures law to allow state agencies to enter into a vehicle fleet maintenance and fuel cost-savings contract.

Strong public leadership will be needed to advance public fleet NGV projects in some jurisdictions. Some state officials and city managers are apprehensive about signing up for NGV projects that require on the order of \$1-10 million of public investment, even if these projects offer long term benefits, due to concern about potential resistance from taxpayers. A public sector “champion” of NGV projects, who is willing to make the case to the public, is often needed to overcome these concerns and move projects along.

■ INTRODUCTION

Alternative fuel vehicles (AFVs) are a small but increasingly important part of the U.S. transportation system. Powered by rechargeable batteries, natural gas, hydrogen, or other non-petroleum-based fuels, AFVs hold the potential to provide public benefits by reducing greenhouse gas emissions, enhancing energy security, and improving air quality. In many applications, AFVs can also offer fuel cost savings to their operators.

Decades of research, technology and market development, and pilot deployments have advanced AFV technologies to a point where deployment is viable in many applications. The U.S. Department of Energy's Clean Cities program has been actively promoting AFVs and fueling infrastructure for over 20 years, supporting deployment that has displaced over 5 billion gallons of petroleum to date.

Despite this progress, challenges continue to limit wide-scale deployment of AFVs and fueling infrastructure, such as high upfront costs, risk aversion, information barriers, and discomfort with the complexity of large fleet conversion and infrastructure projects.

Such constraints do not exclusively belong to the AFV market. In fact, the experience of the U.S. building energy efficiency retrofit market may offer lessons learned and insight for tackling challenges in the transportation sector. In particular, the vital role that Energy Service Companies (ESCOs) have played in delivering \$50 billion in verified energy savings to state, municipal, university, school, and hospital buildings has begun to inspire similar models in the transportation sector.

This paper explores how innovative service contracts that incorporate some of the features of the ESCO business model could help reduce the barriers to vehicle fleet investment in natural gas vehicles (NGVs) and fueling infrastructure.

Starting with a brief overview of the ESCO market, this paper explains how ESCOs reduce barriers faced by energy efficiency and cost savings projects, presents case studies that demonstrate how some of the features of ESCOs are being employed in cutting-edge NGV fleet projects, and explores how these features could be incorporated into innovative business models that reduce the barriers to NGV fleet project investment.

Box 1. Focus on NGVs and Applicability to Other AFV Technologies

While this paper aims to identify lessons that can be applied to a variety of AFV projects, natural gas projects are given focus due to the growing interest in the fuel cost savings and relatively short payback periods these projects can currently offer. These characteristics of NGVs provide a strong parallel with the energy cost savings and cash flows typically seen in ESCO building energy efficiency projects.

Many of the ideas explored in this paper also apply to other AFV technologies, such as electric vehicles or hydrogen vehicles, but many factors also differ among these technologies.

For instance, electric vehicles currently offer the prospect of fuel cost savings, similar to NGVs. In addition, the relative ease and low cost of installing low-power electric vehicle charging infrastructure may present less of a barrier than NGV refueling infrastructure, while the economics of high-power, fast-charging infrastructure may be less favorable than NGV refueling. On the other hand, incremental electric vehicle costs are higher than those posed by NGVs and electric vehicle range and power may limit suitability for some fleet applications.

The immediate applicability of the ESCO model to hydrogen vehicles may be more limited because hydrogen vehicles are not expected to provide fuel cost savings. However, hydrogen vehicle projects do share many barriers with NGV projects, including the need for refueling infrastructure, information barriers, and capital constraints. ESCO-style services that can address these barriers for NGV projects may also be applicable to hydrogen projects.

An ESCO is a business that develops, arranges financing for, and installs projects designed to improve the energy efficiency of and reduce the maintenance

costs for buildings over a 7 to 20 year time period. Traditional ESCOs are not the only commercial entities that could provide ESCO-like services to vehicle fleets. Other companies that develop expertise in NGVs could also provide services, including energy consulting or engineering firms, equipment manufacturers, vehicle

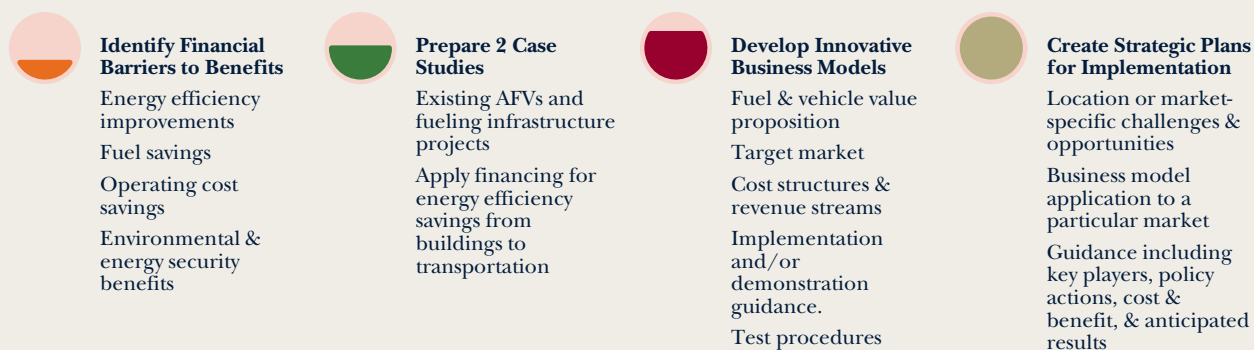
leasing companies, fueling station service providers, or natural gas suppliers. In this paper, the term “ESCO” refers to a traditional energy service company, while the term “energy service provider” refers to the broader set of companies that could provide some ESCO-like services to fleets.

Box 2. C2ES AFV Finance Initiative

C2ES, in partnership with NASEO and with funding from the U.S. Department of Energy’s Clean Cities Program, began a two-year initiative in early 2013 to develop innovative finance mechanisms aimed at accelerating the deployment of AFVs and fueling infrastructure. C2ES has assembled an advisory group of experts on AFVs, infrastructure, and finance from the public and private sectors to help guide its work. The Initiative aims to:

- Identify barriers that hinder private sector investment;
- Develop innovative financing models for vehicle purchase and fueling infrastructure in order to make AFVs more accessible to consumers and fleet operators; and
- Stimulate private-sector investment in AFVs and the associated infrastructure deployment, building upon and complementing investments previously made by the public sector.

The initiative is researching financial barriers, preparing case studies, and developing business models that states can consider piloting at the project’s conclusion:



The Initiative specifically emphasizes two fuels that offer significant opportunities for growth—electricity and natural gas. Biofuels are not considered because the deployment of biofuel-powered vehicles is already being facilitated by many government and private sector stakeholders. Vehicles powered by hydrogen are included, but they are not a major focus because hydrogen fuel cell vehicles are not yet widely available.

More information is available at www.c2es.org/initiatives/alternative-fuel-vehicle-finance.

This paper was prepared as part of the AFV Finance Initiative (the Initiative), a two-year project to develop innovative finance mechanisms aimed at accelerating the deployment of AFVs and fueling infrastructure funded by the U.S. Department of Energy’s Clean Cities program. The Initiative is led by the Center for Climate and Energy Solutions (C2ES) and National Association of State Energy Officials (NASEO) with guidance from the AFV Finance Advisory Group, an assembly of experts on AFVs, infrastructure, and finance from the public and private

sectors. The Initiative’s white paper, *Alternative Fuel Vehicle and Fueling Infrastructure Deployment Barriers and The Potential Role of Private Sector Financial Solutions* (hereafter AFV Barriers),¹ provides a general overview of the barriers to widespread private sector investment in AFV projects. An additional white paper, *The Role of Clean Energy Banks in Increasing Investment in EV Infrastructure*, explores how innovative public finance programs could help reduce the barriers to investment in electric vehicle charging infrastructure.

■ BACKGROUND

BARRIERS TO DEMAND FACING NGV FLEET PROJECTS

The Initiative’s preceding report, *Alternative Fuel Vehicle & Fueling Infrastructure Deployment Barriers & The Potential Role of Private Sector Financial Solutions*,² provides an overview of the barriers standing in the way of more widespread private sector investment in AFV projects and potential solutions to those barriers. The report asserts that innovative financial mechanisms can help address some of the most challenging barriers to increased demand for AFVs and fueling infrastructure including:

- High upfront cost of AFVs;
- Inadequate near-term demand for widespread AFV fueling infrastructure; and
- Uncertainty about benefits and costs of AFVs and related infrastructure.

The current paper explores the barriers to fleet NGV projects in greater detail, with the aim of investigating how innovative ESCO-style service contracts could help fleets overcome these barriers. These barriers, from the perspective of vehicle fleet operators, are listed in Table 1.

STATE OF PLAY OF NGV FLEET PROJECT OPPORTUNITIES

While natural gas has not historically been used widely as an energy source for transportation in the United States, interest in the expanded use of natural gas as a fuel for cars and trucks has grown primarily as a result of the development of abundant domestic natural gas supplies, which has reduced the fuel’s price relative to that of

gasoline and diesel. In addition to the prospect of fuel cost savings, NGVs also offer environmental benefits over gasoline and diesel vehicles, such as reduced climate and air quality impacts. In some cases, heavy-duty NGVs may be a lower cost compliance option with tightening emissions regulations compared to diesel alternatives. Furthermore, adoption of NGVs may offer “green” or energy security related marketing benefits.

This section provides a brief overview of NGV prospects from the fleet perspective in order to provide context for the paper’s discussion of financial innovations to overcome project barriers; the NGV market participants, energy cost savings potential, and fleet vehicle and fueling station costs are presented. More information about natural gas use in transportation is available in the C2ES report *Leveraging Natural Gas to Reduce Greenhouse Gas Emissions* (<http://www.c2es.org/initiatives/natural-gas>) and through the U.S. Department of Energy’s Alternative Fuel Vehicle Data Center website (http://www.afdc.energy.gov/fuels/natural_gas.html).

Natural gas is used to fuel vehicles directly in a pressurized form, either as compressed natural gas (CNG) or as liquefied natural gas (LNG). Currently, CNG is more commonly used as a vehicle fuel, in part because it is easier and less expensive to store and handle than LNG. Because energy is more densely stored in LNG, it is particularly promising for heavy-duty, long-range transportation applications.

TABLE 1: Summary of Barriers to Fleet NGV Deployment from the Perspective of Fleet Operators

FLEET TYPE	BARRIERS TO NGV DEPLOYMENT
<i>All fleets</i>	<ul style="list-style-type: none"> • Insufficient NGV experience and expertise <ul style="list-style-type: none"> ◦ Uncertainty about suitability of available NGV equipment for specific application <ul style="list-style-type: none"> ▪ Vehicle drive and duty performance (range, power, etc.) ▪ Vehicle and fueling station reliability ▪ Time needed to fuel vehicles ▪ Fueling station utilization ◦ Uncertainty about accurately estimating expected cost savings from NGV projects ◦ Uncertainty about how to operate and maintain vehicles and fueling infrastructure ◦ Limited knowledge of technical requirements • Incremental cost of NGVs <ul style="list-style-type: none"> ◦ Ineligibility for auto manufacturer lease specials targeted at individual consumers ◦ Additional cost of modifying maintenance facilities to work on NGVs • Lack of access to either public or on-site NGV fueling infrastructure <ul style="list-style-type: none"> ◦ Insufficient fueling stations available to the public ◦ High upfront cost of and long payback period for project-specific fueling stations • Limited resources to devote to projects <ul style="list-style-type: none"> ◦ Capital and operating budget constraints ◦ Scarce management time to devote to new projects • Small appetite for risk among fleet managers <ul style="list-style-type: none"> ◦ Fuel price spread risk <ul style="list-style-type: none"> ▪ Alternative fuel price ▪ Baseline fuel (diesel or gasoline) price ◦ Technology performance risk <ul style="list-style-type: none"> ▪ Actual on-road vehicle fuel economy ▪ Vehicle and fueling station reliability ▪ Vehicle and station operation and maintenance cost uncertainty • Difficulty coordinating and satisfying the interests of needed project partners
<i>Public fleets</i>	<ul style="list-style-type: none"> • Restrictions on authority to raise and devote capital to energy cost savings projects • Restricted budget management authority • Desire to limit issuance of debt to maintain favorable bond terms • Restricted access to incentives, in particular tax credits • Limited or outdated vehicles available on state bid lists
<i>Private fleets</i>	<ul style="list-style-type: none"> • NGV projects, even when yielding net cost savings, may not meet the company’s internal rate of return requirements for expending financial capital

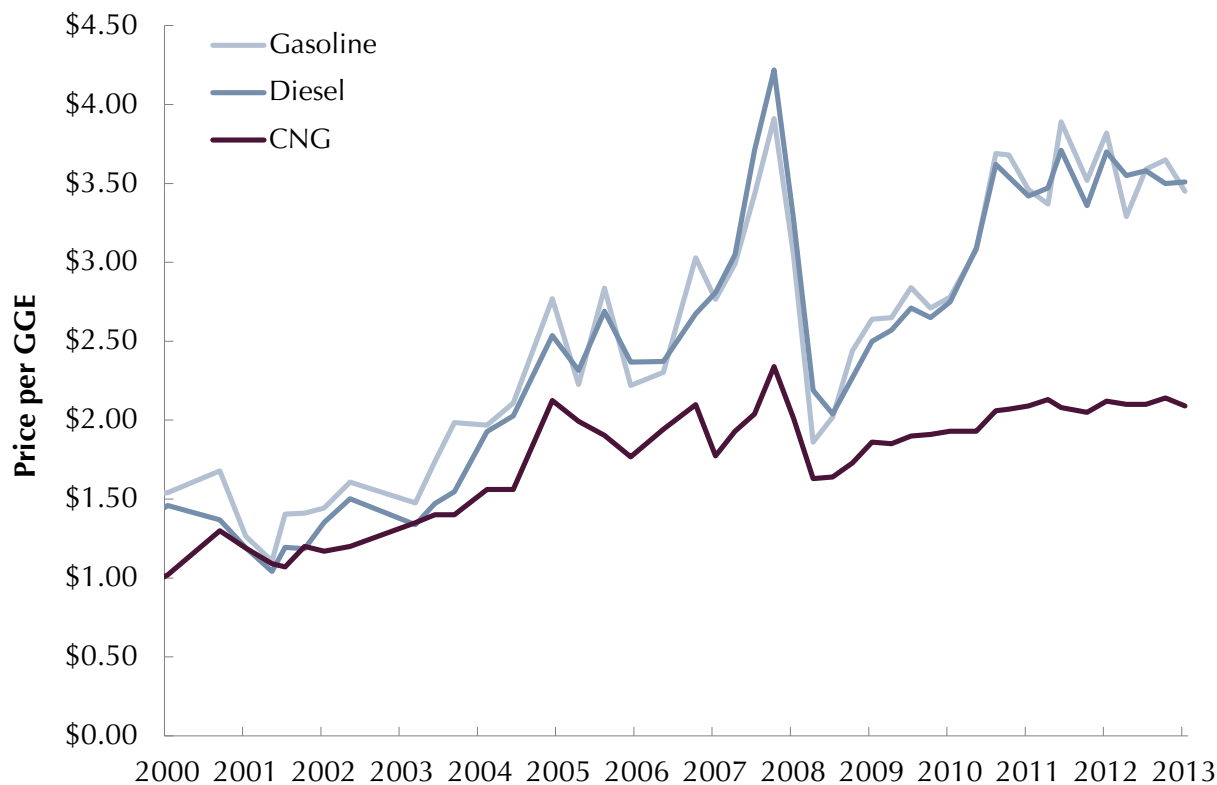
Increasing the use of natural gas as a vehicle fuel requires the deployment of new vehicle technologies as well as the installation of new fueling infrastructure. These outcomes depend on the participation of diverse market participants, including:

- fueling infrastructure manufacturers, installers, and investors;
- investors and managers of local public fueling stations and regional station networks;
- vehicle manufacturers, dealers, and lessors;
- individual and fleet vehicle operators;
- natural gas utilities;
- financiers and other private investors; and
- project consultants and service providers.

When considering a transition from diesel or gasoline to NGVs, the opportunity to realize fuel cost savings is the

primary motivation for most fleet operators. The amount of energy needed to operate NGVs is generally equal to or slightly greater than the energy used to fuel similar gasoline or diesel vehicles, so NGVs do not yield cost savings from reduced energy usage. Therefore, fuel cost savings depend on the difference in price (or “price spread”) between natural gas and gasoline or diesel at the pump, which has averaged approximately \$2 per gallon of gasoline equivalent (GGE) since 2011, as illustrated in Figure 1. Both oil and natural gas prices are set by the market. Natural gas, gasoline, and diesel prices, however, can vary widely by state making the financial favorability of NGV projects geographically dependent. The price spread between CNG and gasoline was as high as \$2 per gallon and as low as \$0.70 per gallon in early 2014.³

FIGURE 1: QUARTERLY U.S. NATIONAL AVERAGE RETAIL VEHICLE FUEL PRICES ON AN ENERGY-EQUIVALENT BASIS



Source: U.S. Department of Energy. “Clean Cities Alternative Fuel Price Report: April 2014.” http://www.afdc.energy.gov/uploads/publication/alternative_fuel_price_report_april_2014.pdf (accessed May 1, 2014).

Fuel cost savings from NGV projects depend on the future fuel price spread, so these investments face some commodity price risk. Abundant domestic gas resources have motivated many analysts to project low natural gas commodity prices well into the future, but this does not guarantee a future price spread. Natural gas fuel prices at the pump are less vulnerable to commodity price risk than gasoline or diesel because natural gas commodity costs make up a smaller fraction of retail fuel price. However, fuel cost savings from NGV projects also depend on relatively high gasoline and diesel prices, which are more volatile due to global commodity and refinery market dynamics.

Currently, some vehicle fleets are beginning to deploy NGVs in large numbers. In public transit and refuse fleets, NGVs account for 20% or more of existing vehicles and perhaps as much as 50% of new vehicle purchases.⁴ NGVs also show promise for significant deployment in other vehicle fleets, including light- and medium- duty service vans and trucks, heavy-duty special purpose vehicles such as concrete mixing transport trucks and mining trucks, and long-haul tractor-trailer trucks.⁵

Fleet operators can incorporate NGVs into their fleet by purchasing new vehicles or retrofitting their existing

fleet. Currently, NGVs cost incrementally more to purchase or lease than comparable diesel and gasoline vehicles because they employ relatively new technologies and have a lower production scale than gasoline and diesel vehicles (see Table 2). The cost of retrofitting a vehicle to operate on natural gas can vary widely and data on all vehicle types is less accessible. For example, converting a pickup truck from diesel to CNG that meets federal vehicle standards can cost between \$9,000 and \$35,000.^{6,7} Fleet operators may be able to reduce the cost of adopting NGVs by replacing existing vehicles with NGVs as they are retired.

As a rule of thumb, under current vehicle cost and fuel price conditions, a diesel truck needs to travel roughly 30,000 miles per year for investment in a vehicle conversion to pay back within 5 years.⁸ For context, the average tractor-trailer traveled nearly 50,000 miles in 2012.⁹ Some fleet managers are comfortable with a target payback of 7 years, while more risk-averse fleets can require a 3-year payback.¹⁰ The willingness of fleet operators to accept a multi-year payback depends in part on the fleet turnover time, which can be as quick as 2-5 years for high-use vehicles.

TABLE 2: INCREMENTAL UPFRONT COST OF NGVS

VEHICLE INVESTMENT TYPE	APPROXIMATE INCREMENTAL COST
<i>Taxi (price premium for CNG compared to gasoline)^{11,12}</i>	\$3,750-\$8,000
<i>Ford F150 pickup truck (price premium for CNG model compared to gasoline model)¹³</i>	\$6,300-\$9,800
<i>General Motors Sierra 2500 pickup truck (price premium for bi-fuel (gasoline + CNG) model compared to the gasoline-only model)¹⁴</i>	\$11,000
<i>Delivery truck (price premium for CNG compared to gasoline)^{15, 16}</i>	\$15,000-\$36,300
<i>Trash truck (price premium for CNG compared to diesel)^{17, 18}</i>	\$30,300-\$60,000
<i>School bus (price premium for CNG compared to diesel)^{19, 20}</i>	\$31,400-\$40,000
<i>Transit bus (price premium for CNG compared to diesel)^{21, 22}</i>	\$31,500-\$50,500
<i>Class 8 tractor-trailer (price premium for CNG compared to diesel)^{23, 24}</i>	\$60,000-\$65,000
<i>Class 8 tractor-trailer (price premium for LNG compared to diesel)²⁵</i>	\$90,000

The “residual value” of NGVs in secondary (used) vehicle markets can be low relative to diesel or gasoline vehicles, which presents an additional risk to NGV investment. Demand for NGVs may be lower in the used vehicle market due to a lack of awareness of new vehicle types, uncertainty regarding the performance of NGVs and their suitability for particular applications, and limited access to fueling infrastructure. On the other hand, the residual value of some durable equipment components, such as fuel tanks, may already be high enough to allay concerns. Furthermore, as NGVs become more common and secondary markets for NGVs develop, these risks will be reduced.

Fleet managers must also evaluate whether an NGV is a good fit for their application. Many current NGV offerings deliver less power, require longer fueling times, have shorter driving ranges, and have smaller cargo compartments than their gasoline and diesel counterparts. While new models are narrowing some of these gaps, fleet operators must evaluate whether NGVs will meet their needs before investing. Bi-fuel vehicles, such as those that can be run on either natural gas or diesel, can mitigate some limitations of NGVs. However, bi-fuel vehicles often cost more, can be more complex to operate and maintain, and can deliver lower fuel cost savings to the extent that diesel is used instead of low cost natural gas.

In most cases, NGV fleet projects will require the installation of fueling infrastructure, which reduces the short term cost saving advantage of NGV projects because fleet operators already have fueling access for gasoline and diesel either onsite or at nearby public stations. While the number of public natural gas fueling stations is growing, there are still less than 800 public natural gas fueling stations in the United States²⁶ compared to about 160,000 gasoline stations.²⁷ The range of upfront costs for installing natural gas fueling stations is shown in Table 3.

CNG and LNG fueling stations consist of an integrated system of components, including compressors, valves, pumps, tanks, sensors and controls, dispensers, and consumer and operator interfaces. Modular fueling station products, such as General Electric’s CNG In-A-Box,²⁸ can simplify procurement and installation in some

applications.

Net savings from reduced fuel cost are also dependent on the scale of an NGV fleet project. Projects with higher fuel usage consistently realize greater net savings.²⁹ Sufficient fuel demand is needed for investment in either public or private natural gas stations to be financially viable. Ensuring adequate demand can be challenging for public fueling stations because of uncertainty about future local demand for natural gas fuel. For this reason, before station construction begins, investors often work to foster relationships with local customers, and in some cases develop fuel purchase contracts, to ensure sufficient demand. Operators of large, centralized vehicle fleets, on the other hand, have the advantage of a substantial, known demand for vehicle fuel, which reduces the risk that a dedicated natural gas fueling station will be underutilized. Smaller vehicle fleets, in contrast, may find it more challenging to generate enough demand to justify investment in dedicated fueling stations.

Fleet projects that include investment in an onsite refueling station have significantly longer payback periods than those that include only vehicle investment. As an example, a project to deploy 20 CNG trash trucks that rely on public fueling stations might have a payback period of approximately 2 years, while the same project that requires investment in a dedicated CNG refueling station might have a payback of 9 years.³⁰ To shorten the payback time of projects that include fueling station investments, fleet operators may elect to open the fueling stations to the public in order to increase station use and revenue.

To help fleet operators estimate cost savings and payback period of natural gas fleet projects, the Department of Energy’s Alternative Fuel Data Center offers the Vehicle and Infrastructure Cash-Flow Evaluation (VICE) tool. This tool features a cost calculator and helps operators understand how net savings are sensitive to various assumptions such as fleet characteristics, fuel price, equipment costs, and operation and maintenance costs. The VICE tool can be found at: http://www.afdc.energy.gov/fuels/natural_gas_infrastructure.html.

TABLE 3: Cost of Installing Natural Gas Fueling Stations

FUELING STATION TYPE	COST RANGE FOR SINGLE STATION
<i>CNG Station: Small (< 3 GPM) Time-Fill or Fast-Fill³¹</i>	\$500,000-\$1 million
<i>CNG Station: Medium (3-8 GPM) Fast-Fill³²</i>	\$1-2 million
<i>CNG Station: Large (8-40 GPM) Fast-Fill³³</i>	\$2-5 million
<i>LNG Fast-Fill Station³⁴</i>	\$350,000-\$4 million
<i>Gasoline/Diesel Station³⁵</i>	\$50,000-\$150,000

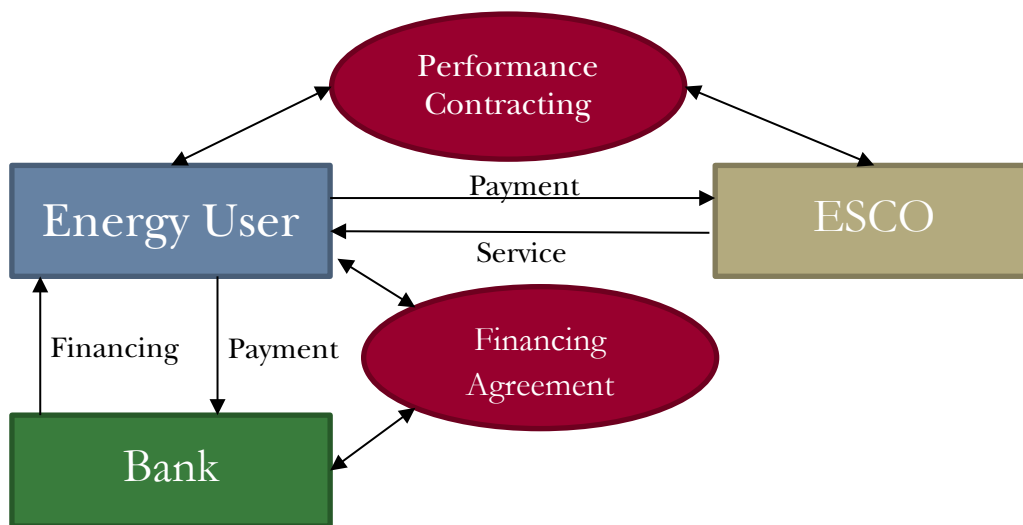
Cost ranges include station equipment as well as installation materials and labor. Cost ranges do not include financing costs or any costs of associated services. GPM refers to the rate at which fuel can be dispensed (in gallons per minute). Time-fill stations can require several hours to refuel a vehicle, while fast-fill stations can refuel a vehicle in only a few minutes.

■ POTENTIAL FOR ESCO-STYLE SERVICE CONTRACTS TO ADVANCE NGV FLEET INVESTMENT

The services that ESCOs provide make it easier for facility managers to use efficiency technologies to reduce barriers such as high upfront costs, risk aversion, and lack of information or experience. The services provided for any particular client vary, but the distinguishing characteristic of an ESCO is that its compensation is typically linked to the amount of energy saved through a

performance contract. This performance contract reduces the risk of investment by guaranteeing that the upfront project cost can be repaid over some number of years through the operational cost savings the project generates. Figure 2 provides a generalized perspective on flow of capital and services among participants in an ESCO service contract.

FIGURE 2: ESCO Business Model Participants and Flows of Capital and Services



To date, ESCOs have been primarily successful in non-commercial markets. More than 85% of ESCO revenues came from services provided to government, university, school, and hospital clients in 2011.³⁶ Successful application of the ESCO model in commercial markets has been limited because:

- Commercial buildings are often rented or leased, which makes energy efficiency investments more challenging due to “split incentives” among building owners, managers, and occupants³⁷ as well as time constraints (leases may end before ESCO projects yield net savings);
- Commercial entities are generally less willing than non-commercial entities to undertake projects with relatively long payback periods and low internal rates of return;
- For many individual commercial market projects, the cost of ESCO services is high relative to the cost savings opportunity because the projects are smaller than typical government, university, school, and hospital projects;
- Uncertainty exists due to lack of experience with commercial ESCO projects, and therefore the potential savings are not as well understood;
- Commercial sector customers lack sufficient expertise about ESCO services as well as time to engage in project exploration and execution; and
- Financial institutions are unfamiliar with commercial applications of the ESCO model.³⁸

Understanding why ESCOs have had limited success in the commercial building market and in formulating new services that can enable expansion beyond the non-commercial markets is an active area of study in the energy efficiency finance community. Some of these issues, such as low tolerance for low internal rates of return, are also felt by commercial NGV projects. Others, such as the split incentive between the asset owner and the asset operator who controls energy use, may not necessarily be relevant for NGV projects.

Insights from experience in the ESCO market can be applied to reduce barriers to investment in NGV projects for both commercial and non-commercial fleets. While ESCOs have little experience providing vehicle fleet services to date, the application of such services to NGV fleet projects is of interest because, like building energy

efficiency projects, NGV fleet projects offer potential operational cost savings, but require upfront investment, significant technical knowledge and face risk aversion and information barriers.

The following subsections identify the features of ESCO services that have helped to reduce barriers to energy efficiency projects in non-commercial markets and explore their potential for reducing barriers to NGV projects. Each subsection begins with a description of how a particular ESCO service has worked in the building sector, followed by an evaluation of how this service could be applied to NGV projects by an ESCO or similar type of energy service provider.

IDENTIFICATION AND EVALUATION OF PROJECT OPPORTUNITIES

As a first stage of client services, ESCOs prepare a front-end evaluation of opportunities for cost-saving projects and provide initial estimates of the savings that these projects are likely to yield. Although some clients are already somewhat familiar with energy cost saving technologies, these services are valuable to clients because ESCOs are highly knowledgeable about the scope of technological solutions. ESCOs possess the expertise to provide authoritative assessments regarding the suitability of these technologies to client operations as well as the estimated energy savings they will yield.

To provide these assessments, ESCOs often interface directly with staff-level employees who are familiar with the assets being evaluated, ensuring that ESCO customers have an informed voice in the project development process. In some cases, a staff-level employee is also the project lead, which can help reduce the project’s time demand on capacity-strained senior managers who may lack the time, expertise, or interest to engage with the details of projects that provide operational cost savings.

Working together, ESCOs and clients use the front-end evaluation to determine which, if any, projects are worth undertaking. If one or more promising projects are identified, the ESCO and the client will draft a service contract that covers the scope of work, project costs and fees for services, and any agreed-upon guarantees of project performance. From the perspective of many ESCOs, upfront evaluations are considered a business development activity, with costs being recovered only if projects are pursued.

Identification and evaluation of project opportunities would likely help address barriers to NGV fleet projects, lack of experience, and limited resources (Table 4). Although many fleet operators are generally aware of the cost saving potential of natural gas as a fuel, most lack

experience with NG equipment, vehicle performance, fueling utilization s. Advice from external experts on the details of implementation and the potential cost savings would likely significantly increase the chances that an NGV project would be considered.

Box 3. Overcoming Policy Hurdles to Applying the ESCO Model in the Building and Vehicles Sectors

While public fleets can be promising markets for applying ESCO models, legal barriers may stand in the way in some states. Laws governing public procurement and the structure of competitive solicitations for goods and services have made some contracts, even ones that would save public agencies money, explicitly illegal.

For instance, Georgia’s state constitution previously prevented state government agencies from entering into agreements that obligated current and future spending to prevent current legislators from creating funding obligations for future government officials. This provision in the constitution prevented contracts that resulted in guaranteed cost savings. A constitutional amendment was passed in 2010 to allow multi-year energy saving performance contracts for natural gas, electricity, and water savings measures.

While many states are presently allowed to enter into ESCO contracts to make energy efficiency investments for public facilities, some states may be unable to include AFV projects in ESCO contracts because these projects reduce energy costs rather than energy use. These states may require legislative changes to enable agencies to include vehicle projects. As an example, new state legislation in Colorado signed a law in June 2013 that expanded the state’s utility cost-savings measures law to allow stage agencies to enter into a vehicle fleet maintenance and fuel cost-savings contract.³⁹

TABLE 4: Barriers to Fleet NGV Projects Reduced by Identification and Evaluation of Project Opportunities

FLEET TYPE	BARRIERS TO NGV DEPLOYMENT
<i>All fleets</i>	<ul style="list-style-type: none"> • Insufficient NGV experience and expertise <ul style="list-style-type: none"> ○ Uncertainty about suitability of available NGV equipment for specific application <ul style="list-style-type: none"> ▪ Vehicle drive and duty performance (range, power, etc.) ▪ Vehicle and fueling station reliability ▪ Time needed to fuel vehicles ▪ Fueling station utilization ○ Uncertainty about accurately estimating expected cost savings from NGV project ○ Limited knowledge of technical requirements • Limited resources to devote to projects <ul style="list-style-type: none"> ○ Scarce management time to devote to analyzing and implementing new projects

It may be challenging for energy service providers to perform upfront evaluations of NGV project opportunities because many of the vehicle and infrastructure products involved in these projects are relatively new, so real-world performance data are limited. This challenge may be particularly applicable to ESCOs, which currently have less experience with vehicle projects than with building projects. These challenges will diminish as more performance data become available and as service providers gain greater experience with vehicle projects.

Even in cases where real-world equipment performance is well known, estimating the fuel cost savings resulting from fleet projects can be difficult; cost savings depend on the uncertain future price spread between the alternative fuel and gasoline or diesel among other factors. This issue is discussed in detail in the “Performance Guarantees” section below.

PERFORMANCE GUARANTEES

As part of a typical service contract, ESCOs may include a guarantee of the energy savings or some level of technology performance associated with the project. For ESCO clients, performance guarantees reduce the risk of projects not generating expected energy savings. Performance guarantees have been a critical component of ESCO services in the building energy efficiency sector.

Performance guarantees could reduce several barriers to investment in the NGV space, as summarized in Table 5. Energy cost saving projects in the building and the NGV sectors share some of the same opportunities (operational cost savings) and barriers (upfront cost and risk that projects do not yield savings). Vehicle fleet managers typically have a small appetite for investment risk, so assurances of energy cost savings could make NGV projects more attractive.

TABLE 5: Barriers to Fleet NGV Projects Reduced by Performance Guarantees

FLEET TYPE	BARRIERS TO NGV DEPLOYMENT
<i>All fleets</i>	<ul style="list-style-type: none"> • Small appetite for risk among fleet managers <ul style="list-style-type: none"> ○ Fuel price spread risk <ul style="list-style-type: none"> ▪ Alternative fuel price ▪ Baseline fuel (diesel or gasoline) price ○ Technology performance risk <ul style="list-style-type: none"> ▪ Actual on-road vehicle fuel economy ▪ Vehicle and fueling station reliability ▪ Vehicle and station operation and maintenance cost uncertainty • Insufficient NGV experience and expertise <ul style="list-style-type: none"> ○ Uncertainty about accurately estimating expected cost savings from NGV project

Providing performance guarantees is more challenging for NGV projects than for building projects. Performance guarantees for energy efficiency projects in the buildings sector typically guarantee energy savings (in energy units, like kilowatt-hours), not energy cost savings (in dollars). The energy cost savings from NGV projects stem from fuel price spreads, not reductions in energy use. Thus to provide greater assurance of energy cost savings for NGV projects, an energy service provider can guarantee natural gas fuel prices, fuel price spread, vehicle fuel economy

performance, or a combination of these.

Guaranteeing fuel prices under an energy service contract transfers the fuel commodity price risk from the fleet operator to the energy service providers. Some fleet operators reduce the risk of changes in future prices by committing to purchase additional fuel for the future at a fixed price. This price hedge provides needed risk reduction, especially for larger vehicle fleets. To the extent that concerns about fuel price risk, in particular, are a key barrier to NGV project investments, then

incorporating fuel price hedging as part of a convenient, one-stop, turnkey service to fleet operators could make a difference in closing NGV project deals.

While fuel price hedging can lock in the price for future fuel purchases, it does not directly address the risk of the price spread closing. Locking in natural gas prices lowers the risk of price increase; however, it does not lower the risk of the price spread closing due to falling diesel prices. Complex fuel price hedging arrangements on both natural gas and diesel could effectively prevent a narrowing price spread. Such hedges are not commonly used by fleets, but they would require a substantially higher risk price premium, which would load additional costs on to NGV projects.

Whether a particular fleet operator will seek to hedge fuel prices to reduce NGV project risk depends upon the company's risk preference, as well as the size and characteristics of the company and the project itself. For many fleet operators, fuel price stability is not worth the extra cost of hedging. Clean Energy, a natural gas fueling station provider, notes that very few CNG vehicle project clients have been interested in fixing natural gas commodity costs in fuel contracts.⁴⁰ Trillium CNG agrees that customers do not frequently opt to fix their natural gas commodity pricing, although the other cost components of the negotiated CNG fuel price, such as capital and maintenance costs, are typically fixed in a long-term contract.⁴¹

Guarantees of technology performance, such as vehicle fuel economy, also can be incorporated into contracts. While vehicle fuel economy performance depends on a variety of factors including driver habits and duty cycles, an energy service provider can estimate the expected vehicle fuel economy based on knowledge of these factors and can guarantee fuel economy performance to the client based upon these factors that falls within a stipulated range.

The potential for such technology performance guarantees to reduce the risk of NGV technology non-performance for fleet operators is somewhat unclear. On one hand, the power of the guarantee is significantly reduced by the fact that it is conditional upon a predefined scenario of driver habits and duty cycles. On the other hand, the guarantee provides fleet managers, who are unfamiliar with NGVs, with critical, best available information about their expected performance.

Projections or assurances of project performance by an experienced party may be able to help energy service clients obtain more favorable financing terms by reducing the perceived risk of the project. Better financing terms, such as lower interest rates or longer loan terms, can reduce the barriers presented by upfront vehicle and station costs by reducing the cost of financing or by lowering monthly payments. NGV technologies are often unfamiliar territory for many banks, so expert analyses of technological risks could reduce information barriers that inhibit the financing of NGV projects. Jerry Peterson, a Project Development Consultant at Johnson Controls, Inc.—an ESCO that manages a performance contract portfolio of over \$6.5 billion⁴²—asserts that, “performance contracting can be thought of as a vehicle to enable better financing. And, regarding the application of performance contracting, there are strong parallels between NGVs and building technologies.” However, the merit of the applicant, not the predicted outcome of the project, remains the primary consideration of lenders.⁴³ Guarantees of project performance are most valuable to the fleet operators, who are ultimately held accountable for the project. Furthermore, some public sector entities may be required by law to secure a performance guarantee in order to enter into an energy service agreement.⁴⁴

In cases where performance guarantees are not required, some energy service clients may determine that the risk of lower-than-expected project performance is low enough that paying for a performance guarantee is not worth the expense. The actual cost of a performance guarantee is difficult to estimate, as guarantees are often central to ESCO services and their cost is lumped into overhead and profit; it is not itemized. However, companies are aware that guarantees come at an “insurance premium” and will be less willing to pay for the guarantees if they are confident in the investment. Scott Minton of OnCue Express, a chain of convenience stores in Oklahoma that offer natural gas fueling at some fueling stations, notes that the awareness of the positive economics of CNG projects is so strong that there is little demand for performance guarantees. NGV projects are particularly favorable in states like Oklahoma that benefit from both particularly low natural gas prices and strong state subsidies for NGV investment. If NGV project costs decline and awareness of costs savings opportunities rises, then performance guarantees are likely to diminish in

value to fleet operators.

It is worth noting that energy service providers face several challenges to guaranteeing NGV project performance. While an energy service provider with extensive NGV project experience may be among the most knowledgeable about NGV vehicles, some vehicle technologies may simply be too new for anyone to confidently project their real world fuel economy. As an example, when Cummins released a brand new CNG engine for Class 8 tractor-trailers in 2013, estimates of fuel cost savings were uncertain because there was little to no data on how the engine would perform in the real world applications. Energy service providers can insure against the risk of not meeting performance guarantees, although pricing this insurance into rates could increase the cost of these services and make them less attractive. Additionally, NGV investments must be designed to generate net savings more rapidly than building energy efficiency projects because many fleets replace their vehicles as quickly as every 2-5 years, while building equipment often lasts 20-30 years. These issues serve as a

reminder that energy service providers cannot shoulder unlimited project risk to reduce barriers for fleet operators. Rather, performance guarantees must be negotiated to balance the risks for both parties.

MANAGEMENT OF TECHNOLOGY TRANSITION

ESCOs can help clients manage projects and transition to new, less familiar technology. Transition assistance can include management of the installation process as well as staff training on operation and maintenance.

The barriers to fleet NGV projects that transition assistance helps overcome are summarized in Table 6. An energy service provider with NGV experience can support fleet managers from the outset of an NGV project and ensure that the integration of new vehicle and fueling infrastructure proceeds smoothly. This can accommodate fleet managers' relative lack of experience with NGV technologies and reduce the need for fleet managers to devote scarce staff resources to the transition.

TABLE 6: Barriers to Fleet NGV Projects Reduced by Management of Technology Transition

FLEET TYPE	BARRIERS TO NGV DEPLOYMENT
<i>All fleets</i>	<ul style="list-style-type: none"> • Insufficient NGV experience and expertise <ul style="list-style-type: none"> ○ Uncertainty about how to operate and maintain vehicles and fueling infrastructure ○ Limited knowledge of technical requirements • Limited resources to devote to projects <ul style="list-style-type: none"> ○ Scarce management time to devote to new projects

Fleet operators deploying pilot fleets of NGVs face the challenge of operationalizing relatively unfamiliar technologies, with new procedures and considerations for fueling station operation and maintenance, vehicle operation and maintenance, fuel procurement, and safety. An experienced energy service provider can guide fleet operators through this process by offering project management, education, and training services.

While clients benefit from energy service providers taking responsibility for transition tasks, clients may not be interested in these services because of a perceived loss of control over their operations. “Customers may be resistant to performance contracting out of fear that they

could lose control of their operations, even if in reality they actually may have more control of operations under energy service contracts,” notes Jerry Peterson of Johnson Controls.⁴⁵ One reason clients may have more control is that, as part of an energy service contract, an energy service provider may install energy management systems that give clients greater information about and control over their energy usage.

At the opposite end of the spectrum, there are other fleet managers who may prefer to never assume control of some components of NGV projects. For instance, fleet operators may choose to let a third-party handle vehicle maintenance for the entire term of the vehicle lease.

Such maintenance service models are already well established in vehicle leasing markets. Fleet operators may also be entirely unfamiliar with fueling station management and may prefer to simply enter into a fuel purchase agreement with an energy service provider. External management of project components throughout the project term can be one benefit of alternatives to equipment ownership, which are discussed in the next section.

ALTERNATIVES TO EQUIPMENT OWNERSHIP

By providing alternatives to asset ownership, ESCOs can reduce the need for clients to invest upfront capital and allow for projects to be funded entirely under operating budgets, which is financially advantageous for some companies and institutions. Such methods of project finance are referred to as “off balance sheet” because the entity does not take on debt or issue equity, which would appear on a balance sheet. Relative to the client, a third party entity such as an energy service provider, may be less sensitive to asset ownership costs and restrictions and may be better positioned to realize tax benefits associated with ownership. The risks and benefits of owning equipment can be efficiently allocated among parties by strategically assigning project asset ownership.

To assist with NGV projects, energy service providers can offer alternatives to vehicle and/or fueling infrastructure ownership, including (1) operating leases for equipment and (2) energy service models where equipment is both owned and operated by a third party. An operating lease for equipment is one alternative to

fleet operator asset ownership. Generically, a lease refers to an agreement under which the energy services client (the lessee) pays the lessor for the use of a capital asset for a specified period of time, often through fixed monthly payments. In contrast, a capital lease is a simple way to finance an asset, and from an accounting perspective, is the same as the lessee purchasing an asset. Under an operating lease, however, the lessor retains the asset throughout the term of the lease and at the end of the operating lease, the lessee has the option to either return the equipment to the lessor or pay the residual fair market value of the asset. Capital leasing arrangements for vehicles are already widely used by many fleet operators, but operating leases are less widespread in the vehicle and fueling station markets.

Fleet operators can also avoid direct asset ownership by having an energy service provider own and operate an asset. For example, an energy service provider could provide install, own, and operate a dedicated fueling station at a vehicle fleet site in exchange for a fuel purchase agreement. Under the fuel purchase agreement, the fleet operator might commit to buy a minimum amount of fuel from the energy provider (a ‘take-or-pay’ contract). Alternatively, the energy service provider might agree to a fuel price structure that motivates the fleet operator to purchase more fuel, such as a volumetric price scale (whereby the client pays a lower fuel price as their purchase volume increases). Table 7 summarizes the barriers faced by NGV projects that alternatives to ownership can help mitigate.

TABLE 7: Barriers to Fleet NGV Projects Reduced by Alternatives to Equipment Ownership

FLEET TYPE	BARRIERS TO NGV DEPLOYMENT
<i>All fleets</i>	<ul style="list-style-type: none"> • Insufficient NGV experience and expertise <ul style="list-style-type: none"> ◦ Need to accurately estimate expected cost savings from NGV project ◦ Uncertainty about how to operate and maintain vehicles and fueling infrastructure • Incremental cost of NGVs • Lack of access to either public or on-site NGV fueling infrastructure <ul style="list-style-type: none"> ◦ Insufficient fueling stations available to the public ◦ High upfront cost and long payback period of project-specific fueling stations • Limited resources to devote to projects

	<ul style="list-style-type: none"> ○ Capital and operating budget constraints ● Small appetite for risk among fleet managers ○ Technology performance risk <ul style="list-style-type: none"> ▪ Actual on-road vehicle fuel economy ▪ Vehicle and fueling station reliability ▪ Vehicle and station operation and maintenance cost uncertainty
<i>Public fleets</i>	<ul style="list-style-type: none"> ● Restrictions on authority to raise and devote capital to energy cost savings projects ● Desire to limit issuance of debt to maintain favorable bond terms ● Restricted access to incentives, in particular tax credits
<i>Private fleets</i>	<ul style="list-style-type: none"> ● NGV projects, even when yielding net cost savings, may not meet the company’s internal rate of return requirements for expending financial capital

Alternatives to equipment ownership can keep projects in the operating budget, which can allow a fleet operator to avoid large upfront costs and as a result realize net savings from day one of the project. In addition, though it may cause some initial sticker shock, bundling project costs into a single payment can simplify the transaction for fleet operators. Keeping project costs in the operating budget can reduce the real and perceived financial risk of the project and shorten the payback period for the fleet operator. As Jerry Peterson of Johnson Controls notes, “Fleet managers are not used to taking risks, and since they aren’t necessarily familiar with the latest technologies—such as CNG vehicles—keeping a CNG vehicle project on the operating budget may keep them more comfortable.” In particular, an energy service provider’s assumption of the station-side payback risk can be a particularly valuable service to fleet operators because fueling station payback is a longer, more uncertain prospect than vehicle payback.

Avoiding the need to secure financing for upfront costs can also make NGV projects more accessible to entities with limited access to capital. Scott Minton of OnCue Express reports that, of all of the large truck fleet managers he has worked with on CNG vehicle projects, almost none of them can afford the \$10,000 per truck upfront incremental vehicle cost. “These customers need to be able to see savings from day one,” he concluded.

Even companies that have very large and flexible capital budgets or little resistance to financing projects with debt may find it easier to keep NGV projects on their operating budget. Such companies may have particular

requirements for capital and operating expenses, including the need for a high return on investment (ROI) for capital spending. Such companies may find it difficult to invest in NGV projects, despite the operational savings they generate, because other investment opportunities are financially more rewarding. A fleet manager at such a company may find it easier to obtain approval from management for an NGV project that avoids comparison with higher ROI projects by remaining on the company’s operating budget.

Avoiding upfront capital outlays can also make it easier for government clients to invest in NGV projects. Many government agencies may be unable to afford to make significant upfront capital investments for fleet projects without raising money through bond issuance. Furthermore, even if issuing a bond is feasible, government clients may prefer to avoid asset ownership because it frees up money for other projects and because limiting public debt may improve bond terms for future projects. Outside ownership of project assets may also advantageously allocate tax benefits from an NGV project between the energy service provider and the client (see Box 4). Not all entities are equally capable of capturing these tax benefits, which include asset depreciation tax benefits and NGV investment tax credit incentive programs.

While third party ownership has many advantages, some government fleets may choose NGV project asset ownership, particularly if an agency possesses an adequate capital budget for such projects. For example, many public fleets pursued NGV projects, such as station

Box 4. Tax Benefits for Natural Gas Vehicles and Fueling Infrastructure

Although federal incentives for NGV fueling infrastructure expired in recent years, many tax incentives still exist at the state level. For instance, Colorado has a 12.25% vehicle tax credit for light- and medium-duty CNG vehicles. Oklahoma has a sizeable tax credit for fueling infrastructure, worth up to 75% of the cost of installing commercial natural gas fueling stations. More information on tax incentives is available at the Department of Energy's Alternative Fuel Data Center website (www.afdc.energy.gov).

ownership, using funds disbursed under the American Recovery and Reinvestment Act of 2009 (ARRA).

Some fleet operators may not have sufficient tax liability to take advantage of the tax benefits of asset ownership. Small companies with limited income as well as companies whose tax liability has already been considerably reduced through other tax deductions fall into this category. Government entities and non-profit organizations generally have no tax liability, and therefore cannot access any tax benefits.

Efficient capture of the tax benefits of NGV asset ownership may require particularly high tax liability because those benefits are worth more if they are used in the early years of the project. Tax benefits associated with vehicle or station ownership can be front-loaded, in line with accelerated federal capital depreciation schedules and federal tax credit incentives for AFVs as well as infrastructure investments that are available immediately.⁴⁶ If a fleet operator does not have sufficient tax liability to fully claim these tax deductions as they become available, then he might forfeit the benefits to another company with greater tax liability. Tax deductions from fuel expenses, however, are spread out fairly evenly over the project period which makes them easier for an entity with limited tax liability to monetize.

In some cases, energy service providers may also be better equipped for project asset ownership than fleet operators. For example, energy service providers may find it easier to amortize investments over long payback periods. Similarly, securing financing may be easier for them to accomplish for several reasons. First, an energy

service provider may be more creditworthy than their fleet operator client. Creditworthiness has been a factor in the ESCO market for building energy efficiency projects because in commercial real estate buildings are often owned by separate limited liability companies (LLCs) that have been established to own a single building and no other assets. Similarly, in some specific cases, lenders may perceive default risk of an energy service provider to be lower than that of the fleet operator, depending on company finances and asset ownership structures. Second, energy service providers can apply their expertise to help arrange financing with loan officers who are less familiar with NGV projects. Finally, energy service providers may be able to leverage relationships with financiers they have worked with on similar projects in the past.

Energy service providers, however, may be limited in their ability to provide asset ownership through operating leases due to potential changes in accounting rules. In May 2013, the International Accounting Standards Board and Financial Accounting Standards Board proposed changes requiring lessees to recognize assets and liabilities arising from their involvement in leases longer than 12 months. This shift in accounting rules aimed to provide greater transparency surrounding leasing transactions and comparability of financial reporting. While the Boards have not announced exactly when the rule changes will be adopted, the changes are unlikely to take effect before 2016 or 2017.⁴⁷

For more information on how innovative leasing models are unlocking investment in other alternative energy sectors, such as residential solar electricity generation, please see the report, *Alternative Fuel Vehicle & Fueling Infrastructure Deployment Barriers & The Potential Role of Private Sector Financial Solutions*.⁴⁸

BUNDLING PROJECTS INTO A PORTFOLIO

ESCOs typically take a portfolio approach to building energy efficiency services by bundling together a suite of cost saving projects with a range of upfront investment costs and payback schedules. This approach enables a holistic facility-wide approach to energy efficiency savings, unlocking synergies between projects and allowing desirable projects that are riskier or offer a lower return on investment to be "subsidized" by less risky, or higher return investments.

Incorporating NGV projects into broader energy service provider project portfolios can help overcome

several barriers to investment, as summarized in Table 8.

TABLE 8: Barriers to Fleet NGV Projects Reduced by Bundling of Projects into a Portfolio

FLEET TYPE	BARRIERS TO NGV DEPLOYMENT
<i>All fleets</i>	<ul style="list-style-type: none"> • Incremental cost of NGVs • Lack of access to either public or on-site NGV fueling infrastructure <ul style="list-style-type: none"> ◦ High upfront cost of and long payback period for project-specific fueling stations • Limited resources to devote to projects <ul style="list-style-type: none"> ◦ Capital and operating budget constraints ◦ Scarce management time to devote to new projects • Small appetite for risk
<i>Private fleets</i>	<ul style="list-style-type: none"> • NGV projects, even when yielding net cost savings, may not meet the company’s internal rate of return requirements for expending financial capital

First, fleet operators may have limited awareness of opportunities and little time to seek out information, and lack trusted sources of information. Energy service providers can work with existing clients, who are familiar with the energy services process and with whom they have an established, trusting relationship, to incorporate NGV projects into their portfolios.

Second, fleet operators may be dissuaded from investment in NGV projects due to perceived risks and relatively low internal rates of return. By bundling NGV projects together with more familiar projects that offer shorter payback periods, the overall portfolio of energy cost saving investments may appear less risky and more favorable to facilities managers.

Third, incorporating NGV projects into broader portfolios of energy projects may unlock synergies that enhance the financial or environmental performance of complementary investments. Total project costs can be reduced if NGV projects share infrastructure or operational costs with other building energy efficiency projects. For example, the total costs of an NGV project and an oil-to-gas boiler conversion project could be reduced if natural gas pipeline and storage investments are shared and fuel procurement is coordinated. AFV projects could also leverage investments in onsite renewable electricity generation. For instance, coupling an electric vehicle fleet project with onsite solar electricity

generation could reduce vehicle charging costs and emissions. Opportunities such as these are numerous, as onsite renewable generation accounted for 6.4% of ESCO revenues in 2011.⁴⁹

The ability of project portfolios to deliver net cost savings in the real world depends on complex factors that require quantitative evaluation. For instance, without careful evaluation, the effect of coupling onsite solar generation with an electric vehicle fleet project on total electricity costs, particularly when clients face tiered electricity rates and demand charges, is unclear. Experienced energy service providers are well positioned to work with clients to evaluate these cost synergy opportunities.

Lastly, for smaller or lower-mileage fleets, the scale of NGV projects alone may be insufficient to justify the transaction costs of entering into an energy service contract. Incorporating NGV projects in a broader facility-wide energy service portfolio could help overcome this barrier. In particular, a company with a scheduled equipment upgrade on the horizon could present the opportunity to incorporate an NGV project into broader energy services where it might not otherwise be considered.⁵⁰

Beyond simply increasing revenue, the portfolio approach can also be beneficial from the energy service provider’s perspective. To the extent that NGV projects

are less predictable compared to other more familiar investments, incorporating NGV projects into a broader portfolio could hedge the risk of non-performance to the energy service provider as well.

PARTNERSHIP FACILITATION

ESCOs can provide additional support and expertise for clients by leveraging their networks of partners who are able to assist with technical or financial matters.

Energy service providers that develop experience implementing NGV projects with various project partners could be well positioned to leverage those partnerships in order to guide new projects towards success. Partnerships with vehicle companies, fueling companies, financiers, insurers, and energy consultants are often key components to the success of NGV projects and help them reduce the project barriers listed in Table 9.

TABLE 9: Barriers to Fleet NGV Projects Reduced by Partnership Facilitation

FLEET TYPE	BARRIERS TO NGV DEPLOYMENT
<i>All fleets</i>	<ul style="list-style-type: none"> • Difficulty coordinating and satisfying the interests of needed project partners • Any barrier that can be reduced by contract features (listed in previous sections) provided by project partners

Vehicle providers, both manufacturers and dealers, can be essential partners. Connecting energy service clients with alternative fuel engine and vehicle manufacturers can provide fleet operators with the detailed technical information they need to be sure that NGVs will meet their needs. Moreover, because so many fleets lease their vehicles, vehicle leasing companies who offer NGVs and have experience working with the vehicles are essential partners for many projects.

Fueling station service companies are also critical project partners as they can assist with the design, installation, and operation of fueling infrastructure. Additionally, fuel providers, such as natural gas or electric utilities, may receive additional assistance from experienced staff members who are dedicated to helping develop alternative fuel vehicle markets.

Many energy service providers do not provide financing themselves. Instead, they rely on third-party financiers to secure capital for energy savings

investments.⁵¹ Energy service providers can streamline the process and secure favorable financing terms by bringing investors that are familiar with NGV projects to the table. These investors may include tax equity partners who can efficiently access tax benefits associated with the project.

Whichever party retains ownership of the vehicles and fueling infrastructure may be securing comprehensive insurance policies for the equipment, particularly because these new technologies may be unfamiliar. Insurance companies could also cover performance guarantees or other aspects of the contract. Energy service providers can bring insurers to the table who are familiar with these projects and who can fairly assess risks, easing the process of obtaining needed insurance.

Finally, energy service clients may demand third-party measurement and verification of energy use, technology performance, and project financial performance. Energy consulting services can help to ensure that the projects play out as planned.

■ CASE STUDIES OF NGV PROJECTS AND INITIATIVES

This section explores case studies of cutting-edge NGV projects and initiatives that incorporate the contract features discussed above. Some of these activities are not being led by traditional ESCOs and differ significantly

from the performance contracting model as it has been applied in the building energy efficiency sector. However, each of these case studies illustrates an example of an energy service provider employing ESCO-like contract

features that reduce barriers to NGV fleet projects. Together, these projects offer early lessons on the types of energy service contracts that can unlock fleet investment in NGVs.

PRIVATE FLEET FUELING SERVICES: TRILLIUM CNG FUELING INFRASTRUCTURE CONTRACT WITH A MAJOR RETAIL FOOD CHAIN

Trillium CNG (“Trillium”), a provider of CNG services including fueling facility design, construction, operation and maintenance, and fuel sales, assisted a major retail food chain (“the client”) with the deployment of natural gas tractor-trailers at one of their distribution facilities. Trillium reduced barriers to the client’s CNG vehicle project by providing the following services:

- *Identification and evaluation of project opportunities:* Upfront technical and financial evaluation assistance.
- *Performance guarantees:* Technical performance and reliability of fueling station guarantees.
- *Management of technology transition:* Education and assistance with project execution.
- *Alternatives to equipment ownership:* Fuel provider retains ownership of station in exchange for fuel purchase agreement.
- *Partnership facilitation:* Vehicle engine manufacturer and natural gas company partners leveraged.

In 2012, the client approached Trillium seeking assistance after the company became interested in incorporating CNG tractor trailers into its fleet to reduce fuel costs as well as its environmental impact. In initial consultations, Trillium educated the client on the available options and helped the company evaluate the financial feasibility of a CNG project by sharing the financial model they had developed. As Trillium helped assess the investment opportunity, the client was not required to share its internal, proprietary financial and operations data with Trillium, as data privacy was an important consideration.

Trillium leveraged their relationships with other companies to help the client learn more about CNG tractor-trailer projects by arranging meetings with representatives from engine and fuel system manufacturers, as well as with experienced local natural gas utility staff.

The client decided to proceed with a project to deploy natural gas tractor-trailers at one of its distribution facilities. The project would include the installation of a dedicated, fast-fill capable CNG fueling station that would not be open to the public. The station would be deployed with sufficient capacity to serve 50 tractor trailers; it also upheld the option to expand capacity to serve additional tractor trailers should the company’s natural gas fleet grow.

Trillium agreed to design, purchase, install, and maintain ownership of the fueling station for the client in exchange for a fuel purchase agreement. Trillium invested \$1-1.5 million in station equipment and \$0.5-0.8 million in installation costs for a total upfront investment of approximately \$2 million. In addition to these costs, Trillium assumed operating and maintenance costs over the course of the 10 year contract and ensured the performance and reliability of the station. Once the contract period was complete, the client could elect to extend the contract, purchase the station equipment, or decommission the station.

For projects like these, Trillium offers a flexible array of fuel purchase agreements. In this case, the client was apprehensive about committing to a minimum fuel purchase volume since it did not have experience using CNG fuel; therefore, the agreement was structured as a long-term fixed fuel price contract with a volumetric price scale. Under this contract, the client paid a lower fuel price as its purchase volume increased, which served Trillium’s interests by establishing an incentive for the company to use more fuel. At the same time, the client’s operational flexibility was maintained because it was not obligated to purchase fuel.

Under this arrangement, Trillium and the client each assumed risks that they considered familiar and comfortable. Trillium assumed the station-side risks of operational performance, fuel price, and station capital investment payback. On the vehicle side, the client replaced about a third of its fleet of diesel class-8 tractor-trailers with comparable CNG trucks that use the 12-liter Cummins Westport engine and in this way and the client assumed the vehicle-side performance and payback risks. Trillium’s assumption of the station-side payback risk was a critical service because fueling station payback is a longer, more uncertain prospect than vehicle payback. As a result of offloading station investment costs to Trillium, this project offered the client an attractive expected ROI.

Additionally, the client was not interested in owning a fueling station, and instead it was able to devote available project capital and staff time to vehicle investment and operation, which the company considered more desirable.

Trillium's ownership of the fueling station also favorably allocated tax benefits and operational budgeting benefits for both parties, although the details of some of these benefits were not publicly disclosed. The client was also able to keep the fueling-side costs of the project on their operating budget in order to realize net savings more quickly and to limit the issuance of debt.

The fueling station was installed and operating by late 2013. The client planned to evaluate whether to expand its fleet of CNG vehicles as it gained operational experience with its pilot fleet of natural gas tractor-trailers. Based on its experiences so far, the client is considering converting additional trucks to CNG and increasing the percentage of CNG trucks in its fleet to 50%.

PRIVATE FLEET NGV SERVICES: GE CAPITAL AND CLEAN ENERGY NATURAL GAS TRUCK PARTNERSHIP

The Transportation Finance business of General Electric Capital Corporation ("GE Capital") and Clean Energy Fuels Corp. ("Clean Energy"), a natural gas fueling provider, have entered into a Strategic Alliance Agreement to accelerate the conversion of heavy-duty trucking fleets from diesel to natural gas.

The Strategic Alliance Agreement aims to help reduce barriers to fleet deployments of Class 8 CNG and LNG long-haul trucks by providing the following services:

- *Identification and evaluation of project opportunities:* Assistance with upfront technical and financial evaluation.
- *Performance guarantees:* Guarantee of technical performance and reliability of fueling station.
- *Alternatives to equipment ownership:* Fuel provider retains ownership of station in exchange for fuel purchase agreement and financier retains ownership of vehicles through operating lease structure.
- *Partnership facilitation:* Financier and vehicle and station providers partner together to provide turnkey service.

In October 2013, GE Capital and Clean Energy announced a strategic alliance to provide complementary

services and equipment to facilitate heavy-duty natural gas truck fleet deployment. The program focuses on introducing Class 8 NGV tractor trailers into fleets of intercity and interstate for-hire trucks that travel at least 60,000 miles annually. GE Capital believes that large long-haul trucking fleets may be motivated to explore NGVs not only to realize fuel cost savings but also to address upstream demand from shippers who are seeking lower-emitting trucking services as they work to reduce their environmental impact and "go green."

For fleets of 1,000 heavy-duty trucks, GE Capital expects that many companies will choose to pilot this program by deploying approximately 10 natural gas trucks. Ed Roberts, Managing Director of Business Development at GE Capital notes that, "Piloting new vehicle technologies is part of the normal course of business for fleets as the technological and regulatory landscapes shift," and that this program is about making it easier for fleet operators to pilot NGVs in their fleets.

Under this program, Clean Energy will provide CNG and LNG with fueling service arrangements to private fleet customers and refer such customers interested in acquiring Class 8 natural gas trucks to GE Capital for potential loan or lease financing.

As a first step in the process, Clean Energy will work with fleet operators to assess opportunities for incorporating natural gas trucks into fleets. While long-haul truck fleet managers are highly experienced with fuel prices and procurement, Clean Energy can provide valuable information on NGV and station attributes (such as duty capabilities and filling speeds), vehicle and station operation and maintenance costs, regulatory issues, fueling station siting, and other factors. If a promising project is identified, Clean Energy will work with the fleet operator to develop preliminary contract terms for fueling station services and a fuel purchase agreement.

Clean Energy offers a multitude of fueling service arrangements. These arrangements range from simply providing maintenance for natural gas fueling stations that are owned by fleets to helping offset the upfront cost of a station for fleets. Additionally, Clean Energy offers services for financing, owning, and operating the fueling station in exchange for a fuel purchase agreement. The latter arrangement is Clean Energy's favored service model, as the company prefers to provide turnkey access to fueling services in exchange for either a take-or-pay fuel purchase agreement or a volumetric fuel price

agreement.⁵²

The fleet operator will then work with GE Capital to arrange loans or leases for natural gas trucks. GE Capital is not sure what the ratio of loans to leases will be, but it anticipates that fleet operators who see a stronger value proposition for natural gas trucks will be more likely to pursue loans for outright ownership, rather than leases.

GE Capital will consider loans for vehicles purchased from third-party providers based on the creditworthiness of the loan applicant rather than the expected financial performance of the NGV project. GE Capital expects that most clients interested in pursuing projects under this program will be companies with large fleets who want to explore new technologies. From GE Capital's perspective, the detailed financial evaluation that would be required to consider loans to a smaller, less creditworthy company would be in most instances too uncertain to provide adequate assurance. Furthermore, such an analysis would generally be too labor intensive to justify, given that these projects are fairly "small ticket," at approximately \$1.5 million for a ten truck project.

Alternatively, GE Capital may offer to finance vehicles through a lease structure and lease them to qualified fleet operators over a 36 to 60 month term. Such leases may take the form of an operating lease, under which GE Capital takes ownership of the vehicles during the lease period and retains the residual value of the trucks at the end of the lease term.

This program is designed to help offset increased upfront investment required of fleet operators converting from diesel to CNG/LNG vehicles. Depending on the terms and structure of the customer's agreements with Clean Energy and GE Capital, the customer may be able to accelerate payback on its incremental vehicle costs (perhaps within one year of investment) and realize net cost savings after interest expense is paid to GE Capital for financing as well as any service fees embedded in the natural gas cost paid to Clean Energy. For some projects, Clean Energy may consider paying for the incremental cost of NGV truck loans or leases over similar diesel models through subsidies paid to GE Capital on behalf of the customer and applied against customer's financing payments, equalizing the monthly payments for the fleet operator. For heavy-duty trucks, those monthly incremental costs are approximately \$400 to \$600 per vehicle. Clean Energy would be compensated for this service through fees incorporated into the natural gas

price structure under the fuel purchase agreement.

As this program is fairly new and these contracts require substantial work before they can be finalized and announced, there are no publicly announced projects yet under this program.

PUBLIC FLEET CONTRACTING FOR AN INDIVIDUAL FLEET: JOHNSON CONTROLS CNG SCHOOL BUS PERFORMANCE CONTRACT WITH THE ROSE TREE MEDIA SCHOOL DISTRICT

Johnson Controls Inc. ("Johnson Controls"), an ESCO, worked with Rose Tree Media School District in Pennsylvania ("Rose Tree") to deploy a fleet of compressed natural gas school buses. Johnson Controls reduced barriers to Rose Tree's CNG school bus project by providing the following services:

- *Identification and evaluation of project opportunities:* Upfront technical and financial evaluation assistance.
- *Performance guarantees:* Fuel cost savings guaranteed, conditional on vehicle fuel economy and fuel price scenarios. Station and vehicle technology performance also guaranteed.
- *Management of technology transition:* Project management of infrastructure installation and vehicle deployment, plus staff training on operation and maintenance of vehicles.
- *Bundling projects into a portfolio:* Leveraged existing ESCO-client relationship; vehicle project added as an addendum to existing performance contract, although project finances are not pooled or linked.

In 2012, Rose Tree and Johnson Controls were working together under a building energy efficiency performance contract when Johnson Control identified a promising state grant opportunity. The Natural Gas Vehicle Development Program, administered by the Pennsylvania Department of Environmental Protection, offered to provide awardees with grants to assist with fleet deployment of heavy-duty NGVs. Johnson Controls and Rose Tree decided to apply for a grant to deploy CNG school buses.

Johnson Controls worked with Rose Tree to design a CNG school bus project that was likely to generate net savings according to their financial model. The modeled project financials are shown in Table 10. Initial evaluation

of the Rose Tree project benefitted from the recent experiences of two other school districts. One nearby school district had converted part of their bus fleet to natural gas and could provide needed information and reassurance to Rose Tree. In addition, Johnson Controls had previously explored a bus conversion project with another school district, for which Johnson Controls had developed expertise and a model for financial evaluation.

Because school districts typically have reliable, detailed data on their routes, and because these routes are very predictable, the uncertainty of the models can be reduced considerably. Given very limited data—the number of buses and distance they drive—Johnson Controls can financially “benchmark” these projects with some degree of confidence.

TABLE 10: Projected financial benefits of the Rose Tree CNG school bus project (initial 23 bus phase)⁵³

	EXPECTED COST, REVENUE, OR SAVINGS⁵⁴
<i>Fueling station and maintenance facility infrastructure costs</i>	(\$2,080,828)
<i>CNG school bus purchase and conversion costs</i>	(\$2,662,663)
<i>Natural Gas Vehicle Development Program grant</i>	\$499,994
<i>Capital budgeted for scheduled bus replacement in 2013</i>	\$200,000
<i>Total net upfront project cost</i>	(\$4,043,467)
<i>Financing cost</i>	(\$1,440,569)
<i>Total net project cost including financing cost</i>	(\$5,484,036)
<i>Operational savings (primarily fuel cost savings)</i>	\$6,522,531
<i>Measurement and verification costs</i>	(\$5,152)
<i>ESTIMATED PROJECT NET SAVINGS</i>	\$1,033,344

Rose Tree submitted a state grant proposal for project funding from the Natural Gas Vehicle Development Program and was awarded \$500,000. This grant bolstered the expected financial performance of the project by offsetting upfront costs, although the project was forecast to provide net cost savings even without grant assistance.

Johnson Controls issued Rose Tree a project development agreement, which the school district accepted. The CNG school bus project was added as an addendum to Rose Tree’s existing contract with Johnson Controls.

Rose Tree operates 74 school buses to meet the transportation needs of their district in Media, PA, a suburb of Philadelphia. In the first year of this project,

Rose Tree will purchase 15 new CNG buses to replace aging diesel buses and will convert an additional 8 diesel buses to CNG in order to deploy a total of 23 CNG buses at the project’s outset. Five years into the project, Rose Tree plans to retire 10 more diesel buses when they reach the end of their useful life and replace them with new CNG buses.

Johnson Controls will manage all onsite work associated with the infrastructure and vehicle transition, including (1) building an onsite “fast fill” CNG fueling station natural gas fueling station, (2) converting Rose Tree’s vehicle maintenance garage to be capable of servicing CNG buses, and (3) converting 8 diesel buses to CNG. To ensure adequate supply of natural gas, the local

utility will install a natural gas distribution line directly to the fueling station. Johnson Controls will also provide transition assistance and staff training to ensure that both the maintenance staff and the bus drivers are trained to properly manage and efficiently operate CNG buses.

Johnson Controls assumes the technical risks associated with all of this work, as they guarantee that the installed fueling station and maintenance garage infrastructure, as well as the converted vehicles, will operate in line with technical performance standards.

Rose Tree will own and operate all project equipment, including the station, maintenance facilities, and vehicles. Johnson Controls notes that, for projects like these, access to finance is a critical factor because it takes time for projects to generate net savings. According to Johnson Controls, the net present value of such projects is likely to either generate slight profits or be budget-neutral.

Under their performance contract with Rose Tree, Johnson Controls guarantees that this project will yield approximately \$6.5 million of fuel cost savings, conditional upon projected vehicle fuel economy and fuel price scenarios being met. Johnson Controls notes that, according to their analysis, converting less than half the existing school bus fleet will pay for all of the costs associated with the CNG transition, and each additional diesel bus replaced with CNG will generate another \$44,000 in savings over the life of the bus. As an illustration of the magnitude of potential annual fuel cost savings, Rose Tree's 2013 budget for diesel fuel was roughly \$520,000, while equivalent cost for CNG fuel would have been \$180,000.

Because the guarantee is conditional on the fuel economy and fuel price scenarios, ultimately Rose Tree bears the risks of lower-than-expected CNG bus fuel economy and a narrowing diesel-natural gas fuel price spread. Johnson Controls formulated the vehicle fuel

economy scenario based on (1) measured fuel economy data from Rose Tree's fleet, (2) National Renewable Energy Laboratory NGV fuel economy data, and (3) fleet management software. The fuel price scenario is based on projections from the Energy Information Administration's Annual Energy Outlook. The project partners expect that the abundant production of shale gas from the nearby Marcellus Formation will keep natural gas prices low for the foreseeable future.

The project will require a "change in use" permit to allow onsite storage and dispensing of natural gas fuel, which involves school district participation in public meetings to discuss the permitting. Johnson Controls is assisting Rose Tree throughout the public engagement process. Construction is expected to begin in the summer of 2014 and should be completed by the fall of 2014. Rose Tree has also applied for a second state grant, this time for \$300,000 to be used for additional CNG buses.

Johnson Controls notes that it will take time for the market for natural gas fleet conversion performance contracts to develop. From the company's perspective, the "stars were in alignment" for this particular project, with a highly engaged public sector client who was comfortable with the performance contracting model and the prospect of extended payback periods as well as the significant government incentives available, the adequate fleet mileage to realize payback, and the abundant natural gas supplies nearby. The company expects that the next few projects will be carried out with school districts with similarly favorable conditions, although as more school districts become interested in natural gas school bus conversions, intergovernmental agreements could emerge to share centralized stations, reducing upfront project costs for all participants and opening opportunities for a broader set of fleets.

■ CONCLUSIONS

As public and private fleet operators become increasingly interested in NGVs, companies are positioning themselves to be early leaders in this growing market. Some of these companies are pursuing business models that incorporate various services that have helped ESCOs unlock investment in building energy efficiency. These business

models are promising because NGV deployment and building energy efficiency present a similar opportunity—energy cost savings—and face similar challenges of high upfront costs, risk aversion, and information barriers.

NGV projects face some of their own unique challenges, however, and business models that aim to

overcome these challenges will need to incorporate novel solutions. The ESCO model as it has been applied in the building energy efficiency sector is not a perfect fit for NGV projects. Energy cost savings can be more difficult to guarantee for NGV projects because they stem from fuel price spreads, not reductions in fuel use, and because the energy performance of vehicles is harder to predict than buildings. Upfront investments, particularly fueling station costs, can be challenging to recoup without sufficient early demand for fuel. New service models offered to fleets could adapt the ESCO model to address these challenges.

Efforts to develop innovative business models to accelerate fleet deployment of NGVs are still nascent. Just as fleets are entering into these contracts to pilot new vehicle technologies, so too are energy service providers, who are looking for workable contract structures that can reduce barriers to investment and foster market development.

While the market will ultimately determine what combinations of services are most effective, lessons from early pilot projects and initiatives indicate which services are promising and guide the exploration of new business models. The section below (1) summarizes the opportunities identified based on the research conducted for this paper and experience to date applying the ESCO model to NGVs and fueling infrastructure projects; (2) presents recommendations for companies and policymakers to help address identified barriers; and (3) lays out the next steps for this project.

KEY INSIGHTS

Turnkey solutions will be particularly valuable to some clients, while others will desire cheaper, more limited services. Fleet operators will demand differing levels of support as they undertake NGV investments depending on how tightly they wish to incorporate NGVs into their operations as well as their level of experience with alternative fuels, their appetite for risk, and their access to capital. Some clients will require turnkey, off-balance-sheet solutions, so that operational savings can be realized from the project's outset in order to minimize risk as well as the need to raise capital. Other clients, particularly those who perceive strong value in NGV ownership, will desire greater control of project financing, operations, and asset ownership; although such clients may seek help with project evaluation and transition tasks. The needs of

many fleet operators will lie between these cases, with contracts addressing specific needs such as tax equity partnerships, vehicle or station technology performance guarantees, asset insurance, operations assistance, and other services.

Public and institutional sector fleets may present a significant opportunity for deploying ESCO-like services built around performance contracting.

Government, university, school, and hospital clients accounted for more than 85% of ESCO revenues in 2011. Just as in the building energy efficiency sector, government and institutional fleet projects are likely to make up the majority of the demand for ESCO services because, compared with commercial fleets, they have a higher tolerance for projects with longer payback periods, reduced focus on maximizing investment return, and the ability of ESCO services to help overcome bureaucratic hurdles. Government and institutional clients are also already familiar and comfortable with the ESCO model, and financial institutions are familiar with applications of the ESCO model in these sectors.

In the future, widespread access to public alternative fuel refueling stations will likely change the services demanded by fleets.

The high upfront cost of installing fueling stations presents a significant barrier for most fleet NGV deployment, especially for commercial fleets, because including a station in the project extends payback substantially. As more fleets become interested in NGV deployment, inter-fleet agreements could be forged to share stations, reducing upfront project costs for all project participants. Further down the road, as publicly available stations become more available, the financial prospect of fleet NGV deployment will strengthen, significantly increasing demand for NGVs and paring back the services required by fleet operators to deploy these vehicles.

RECOMMENDATIONS FOR COMPANIES AND POLICYMAKERS

Energy service providers should continue to develop innovative, diverse services to overcome barriers to commercial fleet NGV investment. Traditional ESCOs have had limited success in the commercial building energy efficiency markets and may or may not be similarly challenged to make an impact in the commercial vehicle fleet markets. The application of the ESCO model to both

building and vehicle projects is hampered by the fact that performance contracting tends to work best for projects with longer payback periods, while commercial entities prefer investments with shorter payback periods. On the other hand, fleet NGV projects may not be encumbered by some of the barriers that have limited the success of ESCOs in commercial building energy efficiency markets, such as “split incentives” and asset ownership by limited liability companies (LLCs) with high risk of default. Energy service providers can establish themselves in the growing NGV services market by offering tailored services that address the specific barriers to commercial fleet NGV deployment. Some private sector fleets are starting to see a strong value proposition in NGVs, and as a result prefer to finance and own the vehicles themselves. Other commercial fleets may perceive investment as more risky, or they may have limited access to capital and thus need to realize savings from the project’s outset. Some companies may need to keep NGV projects on their operating budget to avoid unfavorable comparisons with other more profitable investment opportunities. Most commercial fleets continue to face information barriers and will have need for education, upfront evaluation, and technology transition services. Continued innovation from energy service providers could help overcome all of these barriers.

Companies should forge new partnerships to provide innovative, one-stop services to advance fleet NGV deployment. The expertise and resources required to execute an NGV fleet project are broad and distributed across many business types including vehicle and station equipment manufacturers, vehicle leasing companies, fueling station service providers, fuel suppliers, engineering firms, ESCOs, energy consulting firms, banks, state energy offices, and Clean Cities Coalitions. Formal or informal partnerships among diverse companies that provide complementary services could efficiently provide the needed project assistance for fleet operators.

As ESCOs gain more experience working with vehicle fleets, NGV projects can be advanced by more tightly integrating them into project portfolios. Including NGV projects in facility-wide ESCO portfolios from the outset can allow these projects, which tend to be on the riskier and lower return end of the spectrum, to be “subsidized” by more familiar, less risky, higher return investments. Furthermore, the financial and environmental value of NGV projects may also be enhanced by complementary

projects in an ESCO portfolio, such as renewable energy generation.

In some states, legal barriers prohibit applying ESCO models to fleet projects in the public sector, which can be addressed with policy changes. Some laws governing public procurement and the structure of competitive solicitations for goods and services can make some contracts, even ones that would save public agencies money, explicitly illegal. While many states are presently allowed to enter into ESCO contracts in order to make energy efficiency investments for public facilities, some of these states are unable to include NGV projects in ESCO contracts because these projects reduce energy costs rather than energy use. These states may require legislative changes to enable agencies to include vehicle projects. For example, new state legislation in Colorado signed into law in June 2013 expanded the state’s utility cost-savings measures law to allow stage agencies to enter into a vehicle fleet maintenance and fuel cost-savings contract.

Strong public leadership will be needed to advance public fleet NGV projects in some jurisdictions. Some state officials and city managers are apprehensive about signing up for NGV projects that require on the order of \$1-10 million of public investment, even if these projects offer long term benefits, due to concern about potential resistance from taxpayers. A public sector “champion” of NGV projects, who is willing to make the case to the public, is often needed to overcome these concerns and move projects along.

NEXT STEPS

The next phase of the AFV Finance Initiative is to identify and articulate promising business model strategies that can unlock fleet investment in AFVs. In this paper, the services that ESCOs have successfully employed in the government and institutional building energy efficiency sector were catalogued and the potential of these services to help overcome fleet NGV deployment challenges was explored. This groundwork will serve as the foundation upon which to develop strategies for business models that could reduce AFV investment barriers for specific fleet customer segments. More information on this initiative is available at www.c2es.org/initiatives/alternative-fuel-vehicle-finance.

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