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December 22, 2014

Via Hand-Delivery

The Honorable Earl Taylor
Executive Director
Tennessee Regulatory Authority
c/o Sharla Dillon
502 Deaderick Street, Fourth Floor
Nashville, Tennessee 37243

Re: Petition of Piedmont Natural Gas, Inc. for Approval of a CNG Infrastructure Rider to Its Approved Rate Schedules and Service Regulations
Dockets No. 14-00086 and 14-00087

Dear Mr. Taylor:

Enclosed please find an original and five (5) copies of Piedmont Natural Gas Company Inc.'s ("Piedmont" or "Company") Rebuttal Testimony of Pia K. Powers and Ken Valentine.

This material is also being filed today by way of email to the Tennessee Regulatory Authority docket manager, Sharla Dillon. Please file the original and four copies and stamp the additional copy as "filed." Then please return the stamped copy to me by way of our courier.

Should you have any questions concerning this matter, please do not hesitate to contact me at the email address or telephone number listed above.

With kindest regards, I remain

Very truly yours,

R. Dale Grimes

Enclosures

cc: Melvin Malone, Esq.
Wayne Irvin, Esq.
Sharla Dillon (via email)

Before the
Tennessee Regulatory Authority

Docket No. 14-00086

**Petition of Piedmont Natural Gas Company, Inc.
for Approval of a CNG Infrastructure Rider
to Its Approved Rate Schedules and Service Regulations**

Rebuttal Testimony and Exhibits
of
Ken Valentine

On Behalf of
Piedmont Natural Gas Company, Inc.

December 22, 2014

Q. Please state your name and your business address.

A. My name is Ken Valentine and my office is located at 4720 Piedmont Row Drive in Charlotte, North Carolina.

Q. What is your position with Piedmont Natural Gas Company, Inc. ("Piedmont")?

A. I am the Vice President - Business Development and Gas Technology Services for Piedmont Natural Gas Company, Inc.

Q. Have you previously testified in this proceeding?

A. Yes. I prefiled direct testimony in this proceeding on October 7, 2014 and supplemental testimony on October 31, 2014.

Q. What is the purpose of your rebuttal testimony in this proceeding?

A. The purpose of my rebuttal testimony is to address issues raised and positions taken by witnesses for the Consumer Advocate and the Tennessee Fuel and Convenience Store Association ("TFCA") in this docket. Specifically, I will address issues related to the following subjects: (1) whether retail CNG sales service provided by Piedmont should be regulated or unregulated; (2) whether Piedmont's CNG infrastructure rider proposal in this docket is in the public interest; (3) whether Piedmont's CNG infrastructure rider is consistent with Tennessee statutory authority; and (4) whether the conditional future "protective measures" proposed by the Consumer Advocate and TFCA witnesses are appropriate or necessary.

Q. Before you address these specific issues, do you have any general observations about the positions of the Consumer Advocate and TFCA in this docket?

A. Yes. First, I would note that neither the Consumer Advocate nor the TFCA appear to have any issues with the provision of natural gas service by Piedmont up to the point that such gas is compressed for use as CNG motor fuel. Instead, their issues all seem to revolve around either (i) the provision of compression service by Piedmont and the sale of natural gas in the form of CNG to the public for use as motor vehicle fuel (which is one of the existing services currently provided under approved Rate Schedule 342, and would be the only service provided under Rate Schedule 342 on a going forward basis per Piedmont's proposed change to this rate schedule), or (ii) Piedmont's proposed infrastructure rider mechanism.

Second, it is my opinion that if the Authority accepts the Consumer Advocate's and/or the TFCA's positions in this docket, then the primary impact of that acceptance will be a significant diminution in the opportunity for the State of Tennessee and its citizens to reap the substantial environmental, economic, and energy security benefits of a robust and growing market for CNG vehicles in this state. The loss of these benefits will be a high price for the citizens of Tennessee to pay in order to (1) limit competition between petroleum based fuels such as gasoline or diesel and CNG, which would appear to be the presumptive goal of the TFCA, and/or

(2) protect against completely hypothetical and over-stated risks that the Consumer Advocate and TFCA contend might result from Piedmont's provision of a regulated utility CNG sales service under the supervision of this Authority.

Q. In your opinion, is it appropriate for Piedmont's provision of natural gas for motor fuel purposes to the public to be a regulated utility service?

A. Yes. Piedmont is the sole entity authorized to provide natural gas sales service to the public within its certificated service territory in Tennessee. Our customers utilize this natural gas for a variety of heating, drying, lighting and process purposes. The use of natural gas as a motor fuel is simply another end-use of our product. We typically do not differentiate between customers on the basis of the specific end use they will make of the natural gas we provide but we do differentiate based upon the circumstances and costs associated with such consumption. By that, I mean that our customer classes are segregated largely on the basis of the usage characteristics and cost impacts associated with providing them service. Our residential customers use gas for a variety of purposes (space heating, water heating, clothes drying, and lighting) but typically do so in a residential setting, with small diameter distribution mains and service lines, utilizing equipment that operates at very low pressures, and in circumstances where continuity of service is critical. Our commercial customers typically

use natural gas in quantities greater than our residential customers, at somewhat higher pressures, through larger distribution mains and service lines, usually for less human needs related business processes. Our industrial customers receive natural gas at higher pressures, through larger still mains and service lines, for industrial process and manufacturing purposes. Finally, we serve electric generation customers who use gas at very high pressures. We provide natural gas sales service to all of our customer classes and transportation service to our industrial and electric generation customers.

Q. In your view, is the provision of CNG sales service under Rate Schedule 342 materially different from the other regulated utility services Piedmont provides?

A. No. The only distinguishing characteristic of CNG sales service is the need to increase the pressure of the natural gas in order to store it efficiently in the fuel tank of a motor vehicle. In compressing natural gas for this purpose, no change occurs in either its form or chemical composition.

Q. Does this need to compress natural gas to make it usable as a motor vehicle fuel change it into a different product?

A. No. As I mentioned above, we sell or deliver natural gas to our existing customers at varying pressures, measured in pounds per square inch or "psi". These pressures can range from 3-4 psi for residential service to many hundreds of psi for gas provided to electric gas-fired combustion

turbines. Further, on upstream natural gas pipelines it is completely typical for gas to be compressed up to 1,000 psi or more for transport to downstream markets. Piedmont and upstream providers also routinely liquefy natural gas into LNG storage facilities. These facilities are fully regulated on the basis of federal and state jurisdiction over natural gas transmission and distribution activities. I am not aware of any authority for the proposition that natural gas ceases to be natural gas at a particular pressure or form and it is certainly not regulated that way by the state and federal authorities. I would also point out that while natural gas must be pressurized to place it into a CNG vehicle fuel tank, it is decompressed to a lower pressure when it is actually consumed in a natural gas vehicle engine.

Q. Why do you segregate CNG service provided by Piedmont into separate rate schedules?

A. For two reasons. The first is that CNG sales for motor vehicle fuel use carries separate tax obligations than other sales of natural gas and we need to be able to distinguish between the two types of usage. Second, in cases where customers will provide the compression and dispensing service (i.e. where we just provide the gas or redelivery of the customer's gas), we need to make an exception to our normal tariff prohibition against "sales for resale" by customers receiving natural gas service from us.

Q. Do you see any basis for the proposal to treat CNG as an unregulated service?

A. I think the distinction that the Consumer Advocate and TFCA are focused on is the fact that once a customer receives natural gas from Piedmont, it could then utilize its own compression and dispensing equipment to sell that gas to the public as CNG for motor vehicle fuel purposes and that such utilization could compete with the provision of similar services by Piedmont.

Q. Should the Authority be concerned about this possibility?

A. I have several thoughts on that subject. The first is that the basic rationale of the CAPD and TFCA for utility regulation is the supposition that the underlying service is a natural monopoly (or at least has tendencies in that direction). In this case, I cannot materially distinguish between the CNG sales service Piedmont is currently authorized to provide under Service Schedule 342 and its provision of other natural gas sales services, so it would seem appropriate for the CNG sales service to continue to be provided as a regulated utility sales service. This is supported, I think, by the fact that a number of other states allow regulated CNG sales, including the states of North Carolina and South Carolina, which allow CNG sales service by Piedmont as a regulated utility service.

I think it is also noteworthy that other fully regulated public utilities that are subject to competition remain regulated notwithstanding the fact that they are not monopolies. A clear example of this is Piedmont's acquisition and utilization of upstream interstate pipeline capacity for its Tennessee

customers. Piedmont is interconnected with and has the ability to receive service from no less than 4 interstate pipelines (East Tennessee Natural Gas, Tennessee Gas Pipeline, Texas Eastern Transmission, and Columbia Gulf) and those 4 pipelines actively compete to provide service to Piedmont in Tennessee. Notwithstanding that fact, each of these pipelines is fully regulated by the Federal Energy Regulatory Commission and none of them have monopoly power over Piedmont.

My second thought is that it is at least possible that at some point in the future the "natural gas as motor fuel" market in Tennessee might develop to the point that it could be said to be fully competitive, at which point, it could be concluded that Piedmont's provision of this service should no longer be subject to regulatory oversight by the Authority. The state of this market, both in Tennessee and nationally, is not remotely close to being fully competitive, however, and until it is, it would seem to me that the provision of a regulated CNG sales service, provided under the supervision of the Authority, would be a public benefit by providing a benchmark against the potential exercise of market power by a very few unregulated CNG sales providers. This "transition to a competitive market" is not a new concept for the TRA as that is exactly the successful process it has gone through over the last decade with respect to the gradual deregulation of long distance and then local telecommunications providers.

I would also point out that many of Piedmont's customers, including a

number of high-volume gas-fired combustion turbine customers, have the ability to utilize alternative fuels to operate their equipment and change fuels when it is in their economic best interests to do so. These customers are not captive to Piedmont and Piedmont is directly competing with other energy providers to serve these customers, yet neither the Consumer Advocate, the TFCA or this Authority have suggested that this service should be deregulated. All of this suggests to me that the concept of monopoly market power is not a black or white proposition in the regulation of either Piedmont or other public utilities.

Finally, I would note that I am unaware of any requirement in the Tennessee Statutes governing the provision of utility service that requires Piedmont to be a "monopoly provider of natural gas" in order for its services to be regulated by this Authority. I am not a lawyer, and this may be a technical point, but several of the TFCA and Consumer Advocate witnesses (none of whom are lawyers either) seem to place great emphasis on the lack of complete monopoly status of Piedmont as a CNG provider.

Q. Mr. Valentine, are you aware of whether regulated utilities like Piedmont provide CNG sales service in other states?

A. Yes. Piedmont itself offers CNG motor vehicle fuel sales service to the public in both North Carolina and South Carolina as a regulated utility service pursuant to tariffs very similar to Piedmont's existing and/or proposed rate schedules in this docket. Public Service Company of North

Carolina, Inc., a subsidiary local distribution company, of SCANA also serves the CNG market under tariffs approved by the North Carolina Utilities Commission.

Q. Were Piedmont's proposals in those states the subject of controversy or challenge?

A. No.

Q. Are you aware of other states promoting the sale of CNG by regulated public utilities?

A. Yes. Based upon research I have recently engaged in as a result of reviewing the TFCA and Consumer Advocate testimony, it appears that CNG sales by regulated utilities are allowed and/or the use of CNG vehicles as a public benefit are promoted in at least the following States: California,[1] Utah,[2] Pennsylvania,[3] New Jersey,[4] and Georgia.[5]

Q. Are you aware of any other public utilities or quasi-public utilities that provide CNG service in Tennessee?

A. Yes. Memphis Gas, Light and Water, a municipal utility serving the greater Memphis area, operates a public station for CNG sales. A copy of a presentation regarding that station is attached hereto as Exhibit __(KTV-2) and incorporated by reference herein. I am also aware that Gibson County

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[1] http://www.socalgas.com/regulatory/tariffs/tm2/pdf/GO-CPMR.pdf.
[2] http://le.utah.gov/xcode/Title54/Chapter4/54-4-S13.4.html.
[3] http://portal.state.pa.us/portal/server.pt/community/act_13/20789/natural_gas_vehicle_program/1157504.
[4] http://www.njng.com/save-energy-money/ngv/NGVBrochure.pdf.
[5] See attached Exhibit __(KTV-1).

Utility District, a natural gas utility district serving western Tennessee, is building a public CNG station.

Q. Are you aware of any literature in the public utility arena that discusses whether regulated utilities should be permitted/empowered to promote the development of the CNG market?

A. Yes. Ken Costello, who is a Principal at The National Regulatory Research Institute ("NRRI") published a paper in December 2010 in which he concluded that "state commissions should foster the NGV market – meaning, allow natural gas utilities or their affiliates to charge ratepayers for investing in and operating infrastructure necessary for NGVs – if and when they determine that this action would coincide with the public interest." This paper undertakes a comprehensive analysis of the natural gas vehicle ("NGV") market and the benefits and potential detriments of utility/state commission support for that market. In particular, Mr. Costello engages in a detailed discussion of one of the primary issues in this case, which is whether it is fair or advisable to allow utility ratepayers to support development of the CNG market. A copy of Mr. Costello's report is attached hereto as Exhibit __(KTV-3) and incorporated herein by reference.

Q. Mr. Valentine, both the TFCA and Consumer Advocate witnesses contend that Piedmont's CNG proposals are not in the public interest, can you respond to those conclusions?

A. Yes. As I indicated in my direct testimony, there are multiple benefits to the people of the State of Tennessee that will accrue from the adoption of CNG as an alternative motor vehicle fuel. These include much more than the so-called environmental externalities discussed by Dr. Klein in his testimony, although the significant reduction in emissions associated with CNG use compared to gasoline and diesel is a significant societal benefit. It should also be noted that environmentally, the extraction and transmission of natural gas from domestic wells, when done properly, carries a much lower risk of spills or environmental contamination than the equivalent extraction, refining, and transportation of gasoline or diesel motor vehicle fuel.

It is also important to recognize that natural gas is a domestic and less expensive fuel than either gasoline or diesel[6] and the extraction, transportation and use of natural gas as a motor vehicle fuel is directly responsible for significant economic benefits, including a substantial number of jobs in the United States. On a smaller scale, the growth of the CNG market in Tennessee will create jobs and economic opportunities within the State of Tennessee.

Finally, utilization of CNG as a motor vehicle fuel has been proven to reduce vehicle maintenance expenses, thereby creating economic benefits for people and companies that own and operate CNG vehicles.

[6] The United States Department of Energy reports that in 2012 approximately 40% of oil consumed in the United States was imported from foreign sources and the majority of that was consumed as motor vehicle fuel.

Q. Are you aware of any literature that discusses the benefits of CNG usage as a motor fuel and the potential development of that market?

A. Yes. As mentioned above, the United States Department of Energy has a very comprehensive website devoted to education and information about the use of CNG as a motor fuel. That website is located at http://afdc.energy.gov/fuels/natural_gas.html. I am also aware of a presentation by Stephe Yborra, Director of Market Analysis, Education & Communications, Clean Vehicle Education Foundation and Director of Market Development of NGVAmerica. Mr. Yborra's presentation is a comprehensive look at the state of the CNG markets. A copy of his presentation is attached hereto as Exhibit __(KTV-4) and incorporated herein by reference.

Q. Do you interpret T.C.A. § 65-5-103 as promoting CNG use as a motor fuel?

A. Yes. That statute is designed to permit utilities to propose alternative ratemaking mechanisms for consideration by the Authority and approval if the Authority finds them to be in the public interest. One of the specified categories in the legislation is the creation of alternative ratemaking mechanisms for the recovery of capital and operating costs associated with the promotion of alternative motor vehicle fuels. I think the only reasonable construction of this language is that the legislature believed that the

development of alternative motor vehicle fuels was in the public interest. CNG is just such an alternative motor vehicle fuel.

Q. Several of the Intervenor witnesses have criticized your contentions about the benefits of utilizing natural gas as a motor vehicle fuel because they are unquantified. Do you have any comments on that assertion?

A. Yes, I have several. First, I don't think the benefits of using CNG are as unquantified as these witnesses contend. We know for a fact that we are making growing sales at our public stations and we can tell from customer usage data relevant to Trillium and Waste Management that they are experiencing growing CNG usage. We know for a fact that there is an incremental reduction in greenhouse gas emissions resulting from the use of CNG in the place of gasoline or diesel. We also know that there is a substantial beneficial difference in the delivered price between a gallon of gas equivalent volume of CNG compared to diesel or gasoline and that this price benefit continues to exist even in the face of recent reductions in the price of petroleum based fuels. There is also a direct economic benefit associated with construction activity associated with expanding CNG facilities. We also know that increasing CNG usage enhances energy security for the United States as a whole. The precise scope and scale of these benefits is variable, however, based upon the number of vehicles using CNG and the amount of CNG that is used instead of gasoline or diesel. It is

true that we do not have complete visibility of the current actual number of users of CNG as a motor fuel in Tennessee at this point but we do know that this number is increasing at a high rate, which means each of the benefits discussed above are increasing at a high rate. It would be very strange public policy to turn our backs on an undeniable public benefit because we could not quantify it with sufficient specificity.

Q. Are the benefits of CNG speculative in nature?

A. No. This is an important point. While the benefits of CNG may be difficult to discretely quantify, the benefits are not speculative. They are widely recognized to exist and are documented by a number of state and federal agencies including the United States Department of Energy which sponsors an entire website devoted to the promotion of CNG as a motor vehicle fuel and which expressly identifies each of the benefits I discuss above. The address for this website is http://afdc.energy.gov/fuels/natural_gas_beenfits.html.

Q. Several Intervenor witnesses have also asserted that Piedmont's proposals are not in the public interest because they would create an unfair advantage over competitors. Do you agree?

A. No. My first observation is that at this time those competitors about whom the TFCA and Consumer Advocate are worried about largely do not exist. And to the extent that two now exist in our Tennessee service territory (Trillium and Waste Management), it is because Piedmont has worked with them to create the facilities they are using to receive natural gas at their

premises, upstream of their sale of CNG to the public. The notion that Piedmont's proposals would harm competition is completely hypothetical because there simply isn't sufficient competition in this market at this time. Further, the entire purpose of Piedmont's proposals in this docket is to promote competition and the development of this market. That is part of the reason that proposed Service Schedule No. 343 is an experimental schedule – so that Piedmont and the Authority can gain experience with this market.

Q. Do you have any final observations about the positions of the TFCA and Consumer Advocate in this proceeding?

A. Yes. I think their positions are highly parochial and fundamentally based upon assumed facts and behaviors that have not been shown to exist. I also think they ignore the substantial benefits of the growth of CNG as an alternative motor fuel and focus on maintaining the status quo rather than following the strong trend of many state governments and the federal government in promoting the advancement of a clean, efficient, abundant and domestic alternative energy source to meet our future transportation needs. If their suggestions are accepted, the impact will be a detriment to the establishment of CNG as a meaningful alternative motor vehicle fuel in Tennessee.

Q. Several Intervenor witnesses also suggest certain "protective measures" be adopted by the TRA with respect to Piedmont's tariff proposals if

they are approved by the TRA. Do you agree with these proposed protective measures?

A. No. In my opinion, much of the TFCA and Consumer Advocate testimony amounts to nothing more than concerns that Piedmont's tariff proposals "could" or "might" result in unwanted or undesirable impacts on the CNG market or potential CNG competitors. What is lacking though, is any evidence that they actually will have those results. Further, most of these concerns require the assumption that Piedmont will act inappropriately and contrary to both its own best interests and its stated goals of developing the CNG market in Tennessee. I do not believe that it is appropriate to preclude Piedmont's efforts to assist in the development of a market in Tennessee that has clear public interest benefits solely on the basis of concerns about what "could" happen. I think it is much better public policy to allow Piedmont to participate in this market development under the regulatory supervision of the TRA where customers and potential competitors have ready access to the Authority to address concerns based upon real (as opposed to speculative) facts. Based upon this belief, I see no reason for the Authority to attempt to guess what circumstances could arise in the future when it will have the ongoing opportunity to address any issues with Piedmont's provision of CNG service at the time they actually arise (if they do).

Q. Does this conclude your rebuttal testimony?

A. Yes.

EXHIBIT __(KTV-1)

Atlanta Gas Light Company
Compressed Natural Gas Infrastructure Program

I. Introduction

The Atlanta Gas Light Company (AGL or the Company) Compressed Natural Gas (CNG) Infrastructure Program (Program) is intended to stimulate development of CNG vehicle fueling stations (CNG Stations) in Georgia. The program was approved by order of the Georgia Public Service Commission (GPSC or Commission) on November 29, 2011 and is available to eligible AGL customers anywhere on AGL's distribution system.

The Program will consist of two phases:

1. Phase I – AGL will use $11.57 million from the Universal Service Fund (USF) to provide the compressor(s), storage, controls, etc. (CNG Equipment) at CNG Stations developed under the program. Funding of CNG Equipment under Phase I of the Program will be available for five years, or until the $11.57 million is depleted, whichever comes first.

2. Phase II - Proceeds from commercial activities at the Phase I stations will be used to fund three additional activities.

Under this Program, AGL will not sell CNG directly to retail customers and will not provide land for the CNG Stations. Instead, AGL will install, own, and maintain CNG Equipment for project developers such as fueling services companies, fleet operators, city/county governments, other private enterprise, or any combination of the above (Project Applicants.) The Project Applicants will be required to provide the land, make any necessary site improvements, install and maintain the CNG dispenser(s) and card reader(s), and perform the CNG Retailer function. For the purposes of this program, the customer-owned dispenser(s) and card reader(s), when combined with the AGL-owned CNG Equipment, shall collectively be referred to as the CNG Fueling Infrastructure.

AGL will issue a Request for Proposals (RFP) on or before March 1, 2012. Project Applicants will have the opportunity to submit an application in response to the RFP for CNG Equipment to be approved for their project(s). Project Applicants must meet minimum eligibility requirements and all potential contracting parties must be properly identified. If any of the appropriated $11.57 million remains available for investment following completion of the RFP process the remaining funds will be available thereafter on a first come-first served basis under the same requirements for the balance of the five years.

Although the Program is generally predicated on all the stations being publicly accessible (Public Access Stations), 25% of the appropriated USF funds will be set aside to establish CNG Stations that may allow only limited or no access to the general public (Limited Access S tations.) Limited Access stations will be evaluated separately during the application process and any funds remaining from this up-to-25 percent set-aside will be available on a first come, first served basis to any qualified project applicant.

The USF funds appropriated by the Commission for the Program will reimburse AGL for the installed cost of the CNG Equipment and all resulting income tax liability from these payments, as state law requires such payments from the USF to be treated as Contribution in Aid of Construction (CIAC) payments. Installation of any necessary gas mains, service lines, and metering equipment to provide gas delivery service to the CNG Station will be handled in accordance with AGL's Rule 8 Non-residential Extension Policy and by a separate standard Non-residential Extension Agreement.

AGL will bill CNG Retailers for distribution and compression services (CNG Services) provided at the CNG Stations under the new CNG-1 rate. The CNG-1 rate schedule includes the same delivery charges as AGL's V-52 rate, but replaces the V-52 facilities charge with an O&M charge and Equipment Usage Fee (EUF.) The O&M charge will allow the Company to recover actual costs incurred from providing CNG Services, such as preventive maintenance, repairs, electricity, etc. and will be tracked and billed separately for each CNG Station. The EUF will be calculated based on a percentage of the installed cost of AGL's CNG Equipment, and adjusted on a monthly basis, depending on utilization of the CNG Equipment at each CNG Station. The

revenue from the EUF will be collected by AGL and held in a Reserve Account maintained by the Company to fund the three Phase II activities.

The three Phase II activities are an integral part of the overall CNG Program and will be funded from the proceeds of the EUF paid to AGL by CNG Retailers.

1) Funds held in reserve for eventual replacement of Phase I CNG Equipment
2) Lease buy-down for Home Refueling Appliance (HRA) program
3) Additional Stations under Phase II

II. Minimum Qualifying Criteria and Contractual Requirements

Project Applicants must identify the contracting parties who will enter into the following two agreements with AGL and meet the associated minimum qualifying criteria (including the proposed use of any subcontractors):

1. CNG Retailer Agreement – The CNG Retailer must perform the CNG Retailer function for an initial term of five (5) years and also agree, at a minimum, to the following:

    a. Meet all licensing and other requirements to operate as a CNG Retailer;
    b. Purchase natural gas from a certificated marketer and obtain CNG Services under AGL's CNG-1 Rate;
    c. Own, install and maintain CNG dispensers and card readers;
    d. Perform all activities necessary to process commercial transactions for retail customers using major fleet cards and standard bank credit cards, such as MasterCard and Visa;
    e. Post a CNG retail price expressed in dollars/cents per Gasoline Gallon Equivalent (GGE) at each Public Access station; and
    f. One or more end use customers must commit to utilize a minimum throughput of thirty-thousand (30,000) GGE of CNG annually at each Public Access Station

(cumulatively), or one-hundred-fifty-thousand (150,000) GGE of CNG annually at each Limited Access Station (cumulatively) for each year of the 5 year contract. Under normal station operations, if the minimum throughput is not met as determined on an annual basis for each station, a "take or pay" provision that will be included by the Company in the standard CNG-1 service agreement will be applied to the CNG Retailer's invoice for EUF charges on the deficient volumes.

2. Land Lease Agreement - A property owner must agree to lease the land on which AGL will locate the CNG Equipment for a minimum five (5) year term. The property owner must also agree, at a minimum, to provide:

    a. Convenient access for customers to the fueling island(s) to utilize the CNG Fueling Infrastructure;
    b. Appropriate and timely access to the property where the CNG Equipment will be located to permit AGL employees and other authorized persons to maintain the CNG Equipment; and
    c. A safe working environment for Company employees and others while on the property.

III. CNG Equipment

There is a large range of different sizes, configurations, and costs of CNG Equipment. There are two primary types of CNG fueling, "fast fill" or "time fill", or a combination of the two. The time fill approach requires the least capital investment and is the most cost effective to operate if the vehicles to be refueled will be parked overnight at a central location. This time fill approach involves the compressor(s) delivering the gas directly to each vehicle and slowly raising the pressure over a period of time in all the vehicles simultaneously.

However, most publicly accessible CNG Stations are the fast fill configuration, by which the compressor(s) are coupled with a volume of storage to facilitate filling the vehicles in just a few

minutes through the use of differential pressure. Basically, the gas in storage is maintained at about 4,500 psig so when the fueling hose is connected to the vehicle the pressures begin to equalize and when the pressure in the vehicle storage cylinder rises to 3,600 psig the dispenser would shut off. The pressure in the storage would drop slightly and the compressor would start up to restore it to 4,500 psig over time. If too many vehicles arrive back to back then it is possible that the pressure in the storage could drop too quickly and need several hours to recover. This could cause drivers to have to wait too long to get a complete 3,600 psig fill, so it is very important to design the station with the right combination of compression and storage to match the demand profile of the vehicles.

The CNG Equipment approved under this Program is most likely to be the fast fill configuration so that the CNG fuel can be dispensed in about the same amount of time as the normal fill time for gasoline or diesel. However, the Program does not preclude a time fill CNG Station under certain circumstances as long as the station also includes at least a small amount of fast fill capability for other fleets and/or the general public to utilize. This fast fill dispenser could be installed in a "through the fence" arrangement where the third parties can drive up and refuel without actually coming onto the property.

The following information is provided for illustrative purposes so that prospective Project Applicants may have a better understanding of the components which comprise the CNG Fueling Infrastructure. It also includes the delivery capacities, capital costs, and operating costs of various nominal sizes of CNG Fueling Infrastructure. These estimates do not include any costs for land, site improvements, installation of utilities, or any other unusual conditions. These other up-front costs could vary from minimal - in the case of an existing retail fueling station simply adding a CNG dispenser - to much more significant in the case of a green field project. The estimated cost for AGL to maintain the CNG Equipment is also provided, although the actual costs will vary with throughput. The electrical costs will be even more dependent on the usage profile; a range of the anticipated annual electrical costs are included here for 20 – 80% utilization of the CNG Equipment. Please note this information is just a guide and none of the estimates or information provided herein are guaranteed to apply to any particular project. Actual operating and installation costs will vary and AGL will design and construct the actual

CNG Equipment based on the information submitted for each project, site conditions, and other factors.

Small Station				
Item Description	**Size**	**Quantity**	**Unit Price**	**Estimated Total**
Compressor Package	75 CFM	2	$70,000	$140,000
Motor Starter & Transformer		1	$7,500	$7,500
Dryer		1	$43,000	$43,000
* Dispenser	2-hose	1	$29,500	$29,500
Storage	36,000 SCF	1	$100,000	$100,000
Priority Panel (incl. w/ storage)		1		$0
* Fuel Management System		1	$13,768	$13,768
*Credit Card Access		1	$8,750	$8,750
Design & Commissioning		1	$20,000	$20,000
Installation & Permitting		1	$160,000	$160,000
Taxes			6%	$20,551
Freight				$8,000
PM & Overheads			10%	$55,107
ESTIMATED STATION TOTAL				**$606,176**

Estimated AGL maintenance cost = $25,600/yr.
Estimated Electrical Costs = $6,000 – 21,000/yr.

Medium Station				
Item Description	**Size**	**Quantity**	**Unit Price**	**Estimated Total**
Compressor Package	400 CFM	2	$200,000	$400,000
Motor Starter & Transformer		1	$25,000	$25,000
Dryer		1	$55,000	$55,000
*Dispenser	2-hose	2	$29,500	$59,000
Storage	36,000 SCF	1	$100,000	$100,000
Priority Panel (incl. w/ storage)		1		$0
*Fuel Management System		1	$13,768	$13,768
*Credit Card Access		1	$8,750	$8,750
Design & Commissioning		1	$40,000	$40,000
Installation & Permitting		1	$285,000	$285,000
Taxes			6%	$39,691
Freight				$12,000
PM & Overheads			10%	$103,821
ESTIMATED STATION TOTAL				**$1,142,030**

Estimated AGL maintenance cost = $51,200/yr.
Estimated Electrical Costs = $26,000 – 98,000/yr.

Large Station				
Item Description	Size	Quantity	Unit Price	Estimated Total
Compressor Package	500 CFM	3	$250,000	$750,000
Motor Starter & Transformer	200 hp	1	$35,000	$35,000
Dryer		1	$55,000	$55,000
* Dispenser	2-hose	2	$29,500	$59,000
Storage	36,000 SCF	1	$100,000	$100,000
Priority Panel (incl. w/ storage)		1		$0
*Fuel Management System		1	$13,768	$13,768
*Credit Card Access		1	$8,750	$8,750
Design & Commissioning		1	$40,000	$40,000
Installation & Permitting		1	$375,000	$375,000
Taxes			6%	$61,291
Freight				$20,000
PM & Overheads			10%	$151,781
ESTIMATED STATION TOTAL				**$1,669,590**

Estimated AGL maintenance cost = $87,400/yr.
Estimated Electrical Costs = $50,000 – 180,000/yr.

* Indicates components which would be installed, owned, and maintained by the Project Applicants.

IV. CNG Equipment Sizing

Project Applicants shall submit an annual CNG volume commitment for each proposed CNG Station in Gasoline Gallons Equivalent (GGE) per year meeting the minimum throughput requirements identified above in Section II. The maximum capacity of the CNG Equipment available to be installed will be calculated from the Year 1 annual commitment as follows:

1. The annual CNG volume will be converted to an average hourly delivery capacity and corresponding Standard Cubic Feet per Minute (cfm) of required compression as follows:

   Average Hourly Capacity (GGE) = Annual Commitment / 2,000 Hours per Year

   Min Compressor Capacity (cfm) = Average Hourly Capacity x 2 cfm per GGE

2. The minimum compressor cfm will then be multiplied by 5 to determine the maximum compressor cfm as follows:

Maximum Compressor Capacity (cfm) = 5 x Min. Compressor Capacity

3. A second compressor of the same size as the Maximum Compressor Capacity will then be added to achieve 100% redundancy. In the cases of larger installations where two or more compressors are selected to meet the Maximum Compressor cfm, then just one additional compressor may be added for partial redundancy.

Project Applicants should develop their project financing and proposals in anticipation of the above station sizing methodology which will serve as the basis for determining CNG Equipment design and total cost. The total cost of the CNG Equipment will be used to determine the Cost Effectiveness Ratio (CER) in the RFP scoring process and will also be used to calculate the EUF charges on an ongoing basis. However, AGL reserves the right to modify the size of the CNG Equipment ultimately installed for an Approved Project Applicant if, in the opinion of the Company, the station capacity determined using the above methodology does not serve the public interest.

IV. RFP Process

Phase 1 of the Program will be initiated with a Request for Proposals (RFP) process as follows:

1. On or before March 1, 2012, AGL will finalize the RFP process and advertise applicable dates, guidelines and program requirements through the GPSC's website, AGL's website and statewide print media.

2. Prospective Project Applicants will have forty-five (45) days to respond to the RFP.

3. AGL shall evaluate the RFP responses and issue notices of awards within thirty (30) days and will then proceed to contract with Approved Project Applicants to have CNG Equipment installed at approved CNG Station locations.

4. Project Applicants must enter into a standard service agreement with AGL within ninety (90) days of the award notification.

5. If Project Applicants fail to fulfill their post-award obligations or to execute a standard service agreement with AGL, the award will be deemed null and void.

6. Approved Project Applicants will have thirty (30) days to address the nullification before it becomes final.

7. Once an award is nullified, the designated funds that would have been applied to the Approved Project Applicant's project will be made available to other Project Applicants.

8. Trade Secret/Confidential treatment of materials. Upon request, Project Applicants may have material submitted to the Company treated as Trade Secret or Confidential.

9. Proposals will be scored based on the following formula and component weighting:

    90% - Cost Effectiveness of Initial Throughput Commitment
    5% - Location Characteristics
    5% - Growth Potential

    Total Score = CER * Location Factor * Growth Factor

    1) Applications will first be given a Cost Effectiveness Ratio (CER) score

    Where:
    CER = Cost Effectiveness Ratio (GGE/$)

= Throughput/USF Payment

$$\text{Throughput}_{\text{Total}} = \text{Throughput}_{\text{Year 1}} * 1 + \text{Throughput}_{\text{Year 2}} * (1 - R)^1 + \ldots + \text{Throughput}_{\text{Year 5}} * (1 - R)^4$$

R = Annual Discount Rate

2) Next, the application will be assessed based on the following criteria for location characteristics and growth potential:

X = Location Score, $0 < X < 25$

Y = Growth Potential Score, $0 < Y < 25$

Location Characteristics	Points	Score
Strategic fit for area wide coverage and/or green corridors	0 – 5	
Proximity to interstates/major highways for ease of access, visibility, etc.	0 - 5	
Proximity to other CNG stations (farther apart is better)	0 – 5	
Operating hours for public access	0 – 5	
Security, tenant/cashier available	0 - 5	
Total	X	

Growth Potential	Points	Score
Additional fuel usage potential from anchor fleet	0 - 5	
Project Applicant's plans for promoting CNG and growing throughput	0 - 5	
Population density in surrounding area	0 - 5	

Letters of intent from other fleets in the surrounding area	0 - 5	
Proximity to other fleets in the area	0 - 5	
Total	Y	

3) Next, the total points from the Location Characteristics and Growth Potential assessments are converted to weighted factors as follows:

Location Factor = X / 500 + 0.95
Growth Factor = Y / 500 + 0.95

95% < Location Factor < 100%
95% < Growth Potential Factor < 100%

4) Then the CER, Location factor, and Growth Factor will be multiplied together to yield the Total Score.

V. Optional Considerations Regarding CNG Equipment

Project Applicants may make a voluntary CIAC payment towards the installed cost of the CNG Equipment to increase their RFP score or decrease their EUF charges, but no Project Applicant will be required to make a CIAC payment.

Approved Project Applicants shall acquire the right to execute a standard CNG Retailer agreement with the Company, and the right to purchase AGL's CNG Equipment located at the CNG Station after five years of continuous commercial operations at that location at the higher of the pro rata depreciated net book value or market value of the CNG Equipment.

The net proceeds from the sale of these utility assets will be deposited by the Company into the USF. The Company would continue to provide gas delivery service to the customer's premise through a certificated marketer under the then-applicable V-52 rate.

In addition to any other specialized requests that might be added to the standard CNG-1 service agreement, an Approved Project Applicant may negotiate with the Company to reach mutually agreeable terms and conditions for any or all of the following:

a) To consult on the design of the CNG Equipment and integration with other related components at the CNG Station; or

b) To construct the CNG Equipment; or

c) To maintain the CNG Equipment using properly qualified and trained technicians, and reduce the O&M portion of the Company's tariff rate.

VI. Phase 2 Activities

The EUF revenue collected from CNG Retailers under the CNG-1 rate will be accrued in a Reserve Account and used to fund the following three Phase 2 activities:

1. Upkeep of CNG Equipment

The CNG Equipment will not be funded through AGL's traditional rate base, so in addition to the O&M pass through component of the CNG-1 rate, sufficient additional revenues must be collected from CNG Retailers to perform future upgrades and eventually replace the components comprising the CNG Equipment.

2. Home Refueling Appliance Lease Buy-Down

Immediately upon the effective date of this final order in this proceeding, AGL will begin the process to offer a Home Refueling Appliance ("HRA") Program to homeowners and small business owners who desire to install individual vehicle fueling infrastructure at their residence or business. This will provide an opportunity for customers who might not be located close enough to the Public Access or Limited Access Stations to also have a convenient CNG fueling option. AGL will apply a portion of the proceeds from the Phase I EUF charges to offer a lease "buy-down" program so these potential customers can benefit from the Program. The Reserve Account will be utilized to cover fifty (50%) percent of the estimated cost of the lease for the first five-hundred (500) customers who sign a service agreement with the Company. This HRA lease option will be offered concurrently with Phase I of the Program.

3. Continued Funding of CNG Equipment

The USF funds authorized by the Commission for investment by the Company to install CNG Equipment will be invested under Phase I projects only. Once this initial investment has concluded, any subsequent installation of additional CNG Equipment will be funded using proceeds from the EUF charges. The process for funding additional CNG stations in Phase II will be the same as under Phase I.

Natural Gas Vehicle Delivery Service Rate **V-52**

1. Availability

To any natural gas Customer for use as an energy source for the propulsion of motor vehicles when the natural gas is delivered by the Company into separately metered facilities which compress the natural gas (CNG) for such use, who contracts in writing for service under this schedule, provided that the Company has gas delivery capacity in excess of the then existing requirements of other Customers. The Company may establish minimum levels of annual consumption as a condition of service.

2. Rate

2.1. Delivery Rate

The delivery rate for a commercial customer which utilizes compressed natural gas to fuel motor vehicles owned or operated by the customer or sells compressed natural gas to the public shall be consistent with all applicable charges as set forth in the General Gas Delivery Service. The Customer shall pay 1/12 of the annual charges per month.

2.2 Individual Fill Unit Delivery Rate

Unless metered separately, the delivery rate for residential customers or commercial customers that install Vehicle Refueling Appliance (VRA) or Home Refueling Appliance (HRA) to fuel motor vehicles and do not resell or otherwise redeliver CNG to others shall be included in the Residential Delivery Service and/or General Gas Delivery Service rates applicable to the customer's basic gas service.

2.3. Facilities Charge

Where the Company owns and maintains facilities comprising CNG fueling infrastructure, a monthly charge of one and one-half percent (1.5%) of the gross investment of the Company in such facilities. For purposes hereof, "CNG fueling infrastructure" shall be defined in the service agreement with the Customer but shall consist, at a minimum, of a dryer, compressor(s), storage vessels, controls, cascades, piping, metering, dispensers, and other related facilities and related components..

3. Minimum Monthly Bill

The minimum monthly bill shall be the sum of 1/12 of the following charges: Annual Customer Charge, Dedicated Design Day Annual Capacity Charge, STRIDE Surcharge, Annual Peaking Service Charge and Ann ual Meter Reading Charge, and Facilities Charge (if applicable).

4. Additional Terms and Provisions

Service under this schedule is subject to the Tariff, including the Terms of Service and Rules and Regulations of the Company, as filed with and approved by the Commission from time to time, as well as all future Riders and tariff provisions made applicable to service under this schedule by the Commission from time to time, including without limitation, the Load Control Provisions.

Special Natural Gas Vehicle Delivery Service Rate **CNG-1**

1. Availability

To any Customer operating a commercial motor vehicle fueling operation that sells Gas as an energy source for the propulsion of motor vehicles through facilities owned by the Company and paid for, in whole or in part, from the universal service fund pursuant to O.C.G.A. § 46-4-161 where the Gas is first delivered by the Company into equipment to compress the Gas for the Customer, and, further, who contracts in writing for service under this schedule, provided that the Company has Gas delivery capacity in excess of the then existing requirements of other Customers. The Company may establish minimum levels of annual consumption as a condition of service.

2. Rate

2.1 Delivery Rate

The delivery rate for a commercial customer which sells compressed natural gas to fuel motor vehicles to the public shall be consistent with all applicable charges as set forth in the General Gas Delivery Service. The Customer shall pay 1/12 of the annual charges per month.

2.2 Operations and Maintenance Charge

The Company will collect an Operations and Maintenance (O&M) Charge for the use of the CNG Equipment at each CNG Station as a pass through charge. The O&M charge shall be based on estimated or actual costs for labor, recommended maintenance, repairs and the cost of electricity to operate the CNG Equipment during the upcoming period and shall be billed as a flat monthly fee, trued-up at least annually, to collect all actual expenses incurred over the previous period.

2.3 Equipment Usage Fee (EUF)

2.3.1 The EUF will be an annual fee calculated based on ten (10%) percent of the actual cost of the CNG Equipment, billed in 12 equal monthly installments, and adjusted based on the capacity utilization of each station for the current period, further adjusted to reflect the actual capital contribution invested by the Customer in the CNG Equipment

2.3.1.(i) The annual EUF for each station will be calculated as follows:

EUF = CNG Equipment Cost x 10% x UP x (1 – CIP)

CNG Equipment Cost shall be defined as the total installed cost of CNG Equipment

UP shall be defined as Utilization Percentage, determined by the average daily usage in the last meter reading cycle divided by the daily capacity of the CNG Equipment, where daily capacity is the delivery capacity over an 8 hour day.

CIP shall be defined as Customer Investment Percentage, determined by dividing the Approved Project Applicant's payment towards the CNG Equipment by the total CNG Equipment cost.

3. Minimum Monthly Bill

The minimum monthly bill shall be the sum of 1/12 of the following charges: Annual Customer Charge, Dedicated Design Day Annual Capacity Charge, STRIDE Surcharge, Annual Peaking Service Charge and Annual Meter Reading Charge, and the Equipment Usage Fee, plus the full monthly O&M Charge as determined in the service agreement.

4. Additional Terms and Provisions

Service under this schedule is subject to the Tariff, including the Terms of Service and Rules and Regulations of the Company, as filed with and approved by the Commission from time to time, as well as all future Riders and tariff provisions made applicable to service under this schedule by the Commission from time to time, including without limitation, the Load Control Provisions.

EXHIBIT __(KTV-2)

Memphis Light, Gas and Water Division

MLGW NGV Fleet

March 19, 2014

Ray A. Ward

Gas Systems Engineer, CNG Project Manager

Thinking About CNG Infrastucture Expansion?

How do you explain to your "Upper Management" and "Board" you want to spend $2 million for a large CNG station and you do not have guaranteed customers?

MLGW NGV Fleet

- 1 - 1995 GMC 1500 (in house conversions)
- 10 - 1998 GMC 1500 (in house conversions)
- 9 - 1999 GMC 1500 (in house conversions)
- 9 - 2003 Ford F150
- 3 - 2013 Ford F150 (in house conversions)
- 20 - 2012 Ford F250
- 22- 2014 Ford F250
  - Total 74

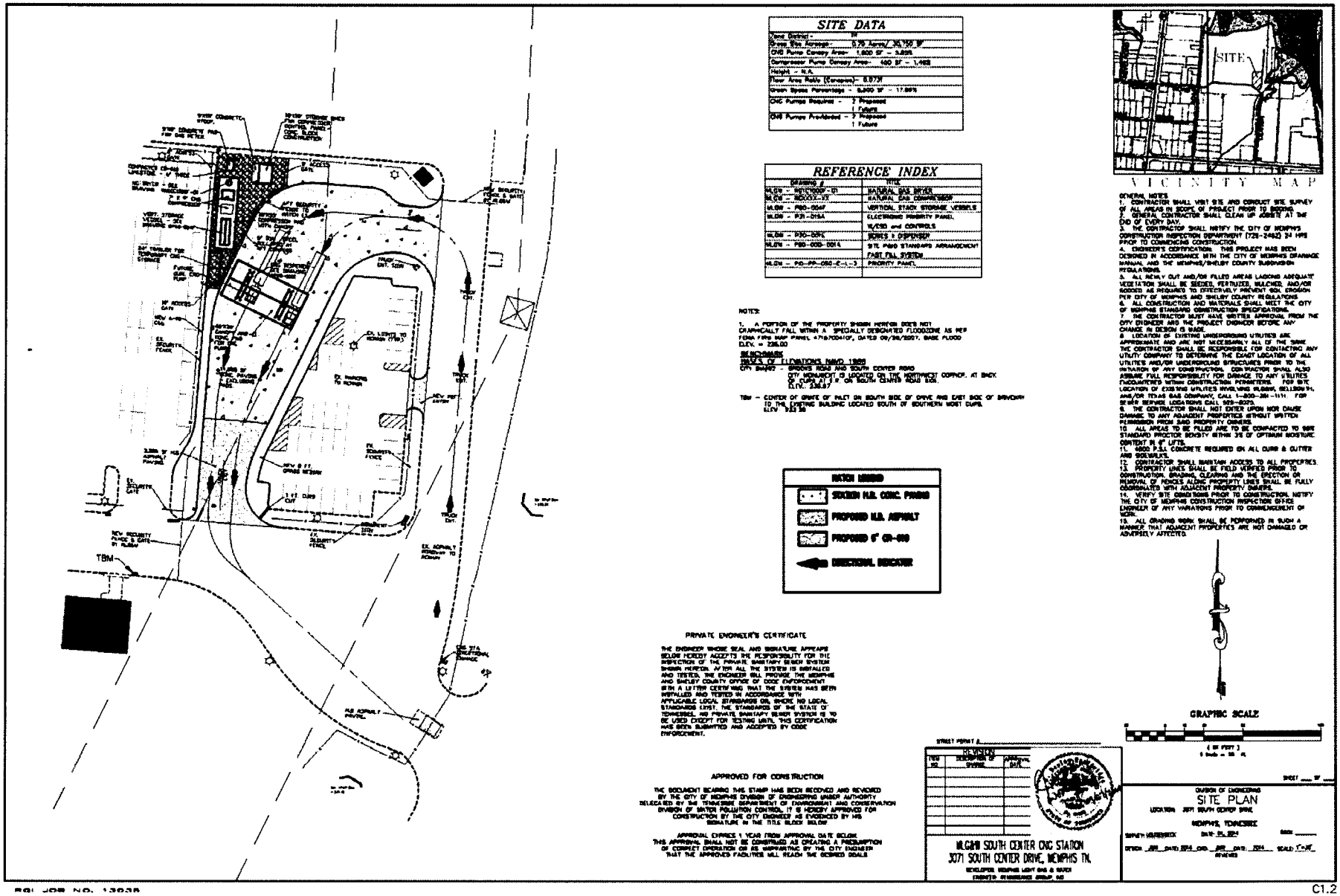
- 24 - 2014 Additions (either will be 2014 or 2015 models)
  - 9 - Ford F150
  - 10 - Ford F250
  - 4 - Ford 250 (with service bodies)
  - 1 – Ford F450

  - **Total MLGW Fleet by the end of 2014 - 98**

MLGW FACTOIDS

- Been using CNG since the late 70's
- Installed private CNG current station in mid 1990's
- Updated CNG station 2012 – 2013, installed new dispenser, credit card reader, more that doubled storage, removed fencing and upgraded area, replaced PLC's, added UPS
- Opened to the public July 2013
  - Dispensed 29,412 GGE of CNG in 2013 (20,462 GGE Internal)
- Station usage in February 2014
  - Total 422 Fills
    - 101 External Customers
    - 321 Internal Customers
    - 5,131.64 GGE
- City of Memphis has a new trash contractor to begin business July 1, 2014, they have ordered 23 new CNG refuse trucks
- LNG
  - Began LNG sales August 2012
  - Two Blu LNG stations to open May 2014
  - UPS will begin using LNG trucks May 2014

New Station Layout



C1.2

The Chicken is Winning

During the first 13 days of March, the # of external customers has tripled and the CNG GGE dispensed has QUARDRUPLED!

CNG
The Right Way to Go!
For All the Right Reasons!

Questions?

EXHIBIT __(KTV-3)

National Regulatory
Research Institute

Briefing Paper

Natural Gas Vehicles: What State Public Utility Commissions Should Know and Ask

Ken Costello, Principal

The National Regulatory Research Institute

December 2010

10-16

Acknowledgments

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Online Access

The reader can find this paper on the Web at:
http://www.nrri/org/pubs/gas/NRRI_natural_gas_vehicles_dec10-16.pdf.

Executive Summary

New technologies for drilling shale gas, heightened recognition of natural gas's smaller carbon footprint compared to gasoline and diesel oil, the motivation of gas utilities to increase profits through demand growth, and advances in transportation-oriented gas technology have all produced a renewed interest in natural gas vehicles (NGVs). This interest leads to the inevitable question of what role state public utility commissions and utilities should play, if any, in growing or reacting to the NGV market.

The premise of this paper is that state commissions should foster the NGV market—meaning, allow natural gas utilities or their affiliates to charge ratepayers for investing in and operating infrastructure necessary for NGVs—if and when they determine that this action would coincide with the public interest. This determination might require state commissions to examine whether such an action advances important regulatory objectives while not impeding others. These objectives can include environmental and other positive social gains that do not directly benefit NGV users.

If state commissions deem NGVs to be in the public interest, they should then determine: (a) whether existing rules and regulations hinder the development of NGVs, (b) the most effective actions to take in removing uneconomical barriers, (c) whether, to what extent, and how utilities should pursue the development of NGVs, (d) whether gas utilities should provide NGV-related services as a core function or through an unregulated affiliate—or not at all, leaving these activities to non-utility players, and (e) the effect of utilities' NGV activities on customers and other regulatory objectives (e.g., cost-of-service rates, fair competition).

This paper has two major purposes. The first is to educate commissions on the status of, and prospects for, NGVs. Compared to vehicles using other forms of energy, NGVs have both favorable and unfavorable features. The appendix highlights the assessments of outside experts on the outlook for NGVs. The consensus is that NGVs and electric vehicles can coexist to displace a portion of the market for conventional vehicles in urban fleets. The most promising markets for NGVs, based on the latest evidence, are commercial and government fleets. Specifically, NGVs' best bet is high-mileage urban (light and heavy) fleets with central refueling.

The second purpose of this paper is to (a) describe the possible roles that state commissions and local gas utilities might play in NGV development, and (b) identify issues that state commissions should address and questions they should ask.

Gas utilities can assume different roles in the NGV market. At one pole they can confine their activities to the provision, under existing regulatory rules, of local gas transportation service: (1) public and private refueling stations and (2) homes with a refueling appliance. In this minimalist role, utilities provide no marketing or promotion of NGVs. They merely provide a natural-monopoly service (e.g., local transportation) at a regulated price. They might also provide city-gate service—for example, the interstate delivery of natural gas to the utility's distribution system. Overall, gas utilities would simply react to the demand for NGVs and not try to affect the NGV market itself.

In a more active role, gas utilities would engage in marketing and promoting NGVs. They might attempt to educate customers on the benefits of NGVs and purchase NGVs for their own fleets. Education and outreach are particularly critical for a technology like NGVs that are largely unknown to the general public. This role might also include advocating for governmental financial incentives at the federal, state, and local levels.

Gas utilities might also provide ratepayer-funded financial incentives for the purchase of home fueling appliances, offer price discounts to customers who have NGVs, and provide financial support for the development of central refueling stations. All of these activities attempt to bolster or "jump-start" the market for NGVs. This paper discusses the fundamental question of whether, and under what conditions, the utility should "charge" all customers for a service that would directly benefit only a distinct minority. One essential condition for such a role is that the gap between the social benefits of NGVs and the private benefits to vehicle owners is large enough to justify a general ratepayer-funded subsidy.

State commissions can influence the development of NGVs. Through their policies, commissions can affect the scope of a utility's NGV-related services, in addition to the utility's incentive to provide those services. In determining cost recovery and the speed of optimal market penetration, commissions should evaluate the merits of new and underdeveloped technologies like NGVs on the basis of their effects on consumers. They will need to:

1. Measure the risks to consumers and utility shareholders,

2. Determine how different cost-recovery mechanisms would affect the utility's financial condition and the risks to consumers,

3. Identify and measure the benefits and costs of new and underdeveloped technologies,

4. Determine the proper market structure for deploying the technology, and

5. Determine the effects of consumer education on the market penetration of new demand-side technologies, such as NGVs.

Table of Contents

Natural Gas Vehicles: What State Public Utility Commissions Should Know and Ask

The optimistic outlook for natural gas in the United States has heightened interest in growing the use of this source of energy in various sectors including transportation.[1] Concerns over our dependency on oil imports and greenhouse gas have elevated the urgency of finding alternatives to petroleum-based vehicles. These alternatives, referred to as alternate fuel vehicles (AFVs), include natural gas vehicles (NGVs), biodiesel, and electric vehicles.[2] They offer our country hope for increased energy independence and a cleaner environment.[3]

The extent to which AFVs will penetrate the transportation market and the contributions of each type hinge on economic, technical, environmental, political, and regulatory factors. A major factor is consumer acceptance of non-petroleum vehicles over petroleum vehicles, which have long dominated the U.S. transportation market.

This paper focuses on NGVs.[4] Fueling sources for NGVs can include compressed natural gas (CNG), liquid natural gas (LNG), or biomethane. CNG allows gas to be stored in a safe and secure cylinder within the vehicle. LNG has the advantage of requiring only 30 percent of the space that CNG needs to store the same amount of energy. The lower space requirement is especially beneficial for heavy-duty trucks traveling long distances. Recoverable from landfills, wastewater, and dairy farms, biomethane emits less pollution than other sources of gas.

This paper has two major purposes. The first is to educate state public utility commissions ("state commissions" or "PUCs") on the status of, and prospects for, NGVs. Compared to vehicles using other forms of energy, NGVs have both favorable and unfavorable features. The appendix highlights the assessments of outside experts on the outlook for NGVs.

The second purpose of this paper is to (1) describe the possible roles that state commissions and local gas utilities might play in NGV development; and (2) identify issues that commissions should address and questions they should ask.

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[1] *See*, for example, U.S. Department of Energy and National Energy Technology Laboratory, *Modern Gas Shale Development in the United States: A Primer*, April 2009; and U.S. Energy Information Administration, *Annual Energy Outlook 2010*, May 2010.

[2] For comprehensive information on AFVs, including state/federal financial incentives and detailed information on each type of AFV, *see* DOE AFV Data.

[3] Natural gas is the cleanest of the fossil fuels and a source of energy that is about 98 percent produced domestically (excluding Canadian imports). NGVs emit about 25 percent less carbon dioxide than comparable gasoline- or diesel-fuel vehicles and produce about 80 percent fewer ozone-forming emissions.

[4] NRRI conducted a comprehensive study on NGVs back in 1992. *See* Daniel J. Duann and Youssef Hegazy, *Natural Gas Vehicles and the Role of State Public Service Commissions*, NRRI 92-8 (Columbus, OH: National Regulatory Research Institute, 1992).

I. Utility Involvement in the NGV Market

A. Utilities can assume a wide range of roles

The development of NGVs offers gas utilities an opportunity to increase their profits. At the least, NGVs would increase throughput on the distribution system, which is the major source of profits for gas utilities.[5] In contrast, increases in natural gas demands by the electric power producers would benefit gas utilities less because many, if not most, gas-fired generating facilities bypass the local gas utility system.[6]

Gas utilities can assume different roles in the NGV market. At one pole they can confine their activities to the provision of distribution service under existing regulatory rules to (1) public and private refueling stations and (2) homes with a refueling appliance.[7] In this minimalist role, utilities provide no marketing or promotion of NGVs. They merely provide a natural-monopoly service (e.g., local transportation) at a regulated price.[8] They might also provide city-gate service—for example, the interstate delivery of natural gas to the utility's distribution system.[9] Overall, gas utilities would simply react to the demand for NGVs and not try to affect the NGV market itself.

In a more active role, gas utilities would engage in marketing and promoting NGVs. They might attempt to educate customers on the benefits of NGVs and purchase NGVs for their own fleets. Education and outreach are particularly critical for a technology that, like NGVs, is largely unknown to the general public.[10] This role might also include advocating for governmental financial incentives at the federal, state, and local levels.

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[5] This new throughput might require new investments that utilities can include in rate base and make a return. In a revenue-decoupling world, utilities' profits could increase less or not at all in the short term.

[6] Bypass occurs when a new or existing consumer takes natural gas off the interstate or intrastate pipeline system. These consumers, therefore, require no or minimal services from the local utility.

[7] Distribution service include transportation from the city gate to the customer's premises as well as backup, storage, and load balancing provided to transportation customers.

[8] One issue is the price they should charge. The utility might justify lower rates to homes with a refueling appliance on the basis that these customers would have a higher load factor than other residential customers.

[9] This situation would occur when the customer has to buy the natural gas itself from the local gas utility. As an example, a residential customer who refuels her NGV at home might not have the right to purchase natural gas from sellers other than the local utility.

[10] Evidence has shown that consumers tend to be myopic in not accounting for the life-cycle benefits of durable goods like motor vehicles. Such shortsightedness, caused by such factors as uncertainty about the future and imperfect information, might warrant government or utility intervention. It might include better consumer education and financial incentives.

Gas utilities might also provide ratepayer-funded financial incentives for the purchase of home fueling appliances, offer price discounts to customers who have NGVs, and provide financial support for the development of central refueling stations. All of these activities attempt to bolster or "jump-start" the market for NGVs. Part III.A of this paper discusses the fundamental question of whether, and under what conditions, a utility should "charge" all customers for a service that would directly benefit only a distinct minority. One essential condition is that the gap between the social benefits of NGVs and the private benefits is large enough to justify a subsidy.

In sum, gas utilities can assume different roles. They range from a minimalist role to a more active role in which utilities attempt to act as a catalyst for market activities. The latter function might include managing and funding an upgraded infrastructure (e.g., refueling stations) that would simulate the market for NGVs. It might also involve promotional activities that subsidize consumers for NGV-related services that utilities provide.[11] An important question is: If utilities, with approval from their commission, engage in active promotion of NGVs with financial assistance from ratepayers, how long should they be able to carry out this activity? If "jump-starting" the NGV market is the rationale for promotion (e.g., giving financial assistance to NGV owners), good commission policy would limit both the money spent and the duration of such activities.

B. Specific utility functions

Possible utility functions are as follows:

1. *Selling of distribution service:* The utility would deliver natural gas owned by a third party from the city gate to the party's refueling station at low pressure; the station would then compress the gas and dispense it at high pressure into NGVs.

2. *Selling of bundled sales service:* The utility would sell the commodity natural gas, and interstate and local transportation to third-party refueling stations.

Incidentally, benefits-myopic consumers are a major rationale for utility activities promoting energy efficiency.

[11] Questar in Utah has taken a more active role than other gas distributors in the development of NGVs. It has, among other things, (1) assisted fleet operators and others in the building and operation of refueling stations, (2) worked with state and local governments to promote NGVs, and (3) helped to assure adequate utility system requirements to accommodate growing demand for NGVs. Questar's service territory has more than one hundred refueling stations, some of them owned and operated by the utility. Utah has seen a large number of used NGVs imported from other areas of the country. See *American Gas*, "Full Speed Ahead," April 2010: 22-26, at Full Speed Ahead.

3. *Selling of bundled sales service plus "fueling" service:*[12] Besides providing delivery and commodity gas, the utility would own refueling stations in which it would compress the gas and dispense it for vehicle use.

4. *Selling or leasing of home refueling appliances:* The utility would own these appliances and rate base them or lease them to customers who own NGVs.[13]

5. *Dissemination of information on NGVs:* The utility would educate customers on the benefits of NGVs and the availability of government financial incentives.

6. *Marketing of NGVs through promotional and other practices:* The utility would offer discounted rates for NGV-related services and provide financial and other assistance to refueling stations or other entities involved with NGVs.[14]

7. *Research and development (R&D) activities and funding:* The utility would perform the R&D itself or, more likely, contribute funds to other organizations for R&D activities that, among other things, would improve the economics and consumer acceptability of NGVs.[15]

8. *Expansion of infrastructure to accommodate NGVs:* The utility might have to expand its facilities to accommodate NGVs.[16] One possible expansion would be an increase in the number of distribution lines to refueling stations. A utility might also partner with other entities to develop the necessary infrastructure.[17]

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[12] Although gas utilities might have the capability to provide services, such as vehicle repair and maintenance, conversion of vehicles to NGVs, and equipment sales, the author assumes that they are unlikely to do so.

[13] By leasing home refueling appliances, the household would not have to make substantial investments in purchasing, installing, and maintaining the appliances. Third-party financing might help to alleviate this problem.

[14] Discounted rates reflect value-of-service rates that account for the demand characteristics of customers. These rates are discriminatory in that the utility charges different rates to customers in the same class (as long as they fall within the zone of allowable rates). Discounted rates raise the issue of who should bear the cost of discounts (i.e., revenue shortfalls from fully allocated cost revenues)—utility customers, utility shareholders, or both groups sharing the costs.

[15] A major issue revolves around who should fund R&D activities—utility customers, utility shareholders, or both groups sharing the costs.

[16] As with the previous two roles, a major policy issue is who should bear the costs—utility customers, utility shareholders, or both groups.

[17] On September 7, 2010 Atlanta Gas Light (AGL) filed a proposal with the Georgia Public Service Commission to build refueling stations for the purpose of encouraging public and private fleets to purchase NGVs. As expressed in its filing, AGL hopes to "seed the market." The utility sees the lack of refueling stations as the primary barrier to the development of NGVs.

C. Market structures for different NGV-related functions

Market structure refers to the number and concentration of sellers and buyers that consummate trades for specific goods or services and entry conditions affecting those sellers and buyers. The three broad descriptions of market structure are competitive, oligopolistic, and monopolistic. When a market has several actual or potential buyers and sellers, with minimal entry and exit barriers, analysts consider it competitive. In competitive markets, individual firms have no effect on market prices. Oligopolistic markets have few sellers, with each firm having some influence over price. Monopolistic markets have one seller and severe entry barriers. As a rule, if a market is effectively competitive[18] or even oligopolistic,[19] the best results happen with no price regulation. Some markets in their nascent stage lack competitive features, but at a later time acquire them through technological changes, fewer entry barriers, and better-informed consumers.

The previous discussion on possible functions that utilities can perform in the NGV market leads to the policy question of whether non-utility entities can perform them feasibly and economically. If transactions for a specific service, for example, can consummate in a competitive market, the commission should then eliminate any entry barriers that might stifle competition. In this instance, the utility should not have a monopoly in that market and participate as a regulated entity; the commission might also decide not to allow the utility's unregulated affiliate to participate in that market as well.[20] At the other end of the spectrum, if

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The utility proposes to work with fleet operators and local governments to construct central refueling stations. It also proposes to work with fleet operators and CNG retailers to encourage market participation. (*See* Docket 32499)

[18] An effectively competitive market would have a number of features, including (a) consumers have real choices for goods and services, (b) consumers receive proper price signals, (c) individual suppliers are unable to control prices, and (d) no individual firm has an unfair advantage over other firms.

[19] Analysis of oligopoly markets lacks a unifying theory in producing precise, useful results relating market structure to conduct and performance. Oligopoly theory, for example, does not offer any definite price predictions analogous to the predictions of perfectly competitive and monopoly markets. Most theories that are applied predict that prices in oligopoly markets are greater than marginal cost but less than the price of a pure monopolist. Various oligopoly models predict different outcomes because of their varying assumptions about how firms behave, the number of firms in a relevant market, the characteristics of a market and the products sold, and the degree of interaction between firms. *See*, for example, Luis M.B. Cabral, *Introduction to Industrial Organization* (Cambridge, MA: The MIT Press, 2000), 99-126.

[20] Several sources can account for problems from a utility-affiliate relationship: the pricing of utility-affiliate transactions, cost shifting, cross-subsidization, discriminatory regulated service from "essential facilities," mandatory tying of "essential facilities" service and unregulated service, and discriminatory release of information from a utility to unregulated entities.

the most efficient market structure for a service (e.g., gas distribution) is a natural monopoly, then having the local gas utility as the sole provider makes economic sense. [21]

Table 1 lists the different NGV-market functions and the possible entities that can perform those functions. Although the local gas utility can perform all of the functions listed, other parties can perform most of them as well. The table suggests that third parties can assume several functions in the NGV market, with the utility role limited to providing only the natural-monopoly service, local distribution. The burden, therefore, lies with the utility to show that it should perform a number of functions that other entities presumably can perform. Whether third parties would perform these functions in a competitive environment is a legitimate question that commissions would need to ask. Especially in an underdeveloped market such as that for NGVs, competition might be difficult to achieve initially.

As one illustration, refueling stations do not have the characteristics of a natural monopoly. A market should be able economically to sustain several refueling stations; but this premise assumes a developed market with a large number of NGVs. At the initial stages, however, the number of NGVs might be too small to sustain more than a few refueling stations. Without a regulated utility-owned refueling station, these few stations can exercise market price by charging excessive prices (assuming that they are not subject to price regulation). Thus, a regulated utility-owned refueling station can constrain the price charged by other stations. On the other hand, utility presence in the refueling station can discourage the entry of third-party stations. The utility might have cost advantages because of economies of scale or scope or other advantages that could act as a barrier to the entry of third-party entities. A policy question then becomes: How can a state commission create a "level playing field" between utility-owned and third-party refueling stations?

[21] According to one definition of a natural monopoly, if total production costs rise when two or more firms produce instead of one, the single firm in a market is called a "natural monopoly."

II. Essential Information for Commissions

In making good decisions about the utility's proper role in the NGV market, commissions should have certain information, which includes:

Barriers to NGV development

1. Regulatory barriers to the development of NGVs
2. Market barriers to the development of NGVs
3. Market barriers that represent market failures or distortions that might justify government or utility intervention (e.g., financial incentives)[22]
4. Different regulatory, utility, and other actions that address individual regulatory and market barriers and their associated costs

Economics of NGVs

1. The conditions (e.g., technological advancements, low natural gas prices) required for the economic attractiveness of NGVs compared to other AFVs and petroleum vehicles[23]
2. Reasons for the current low penetration rate of NGVs in the U.S.[24]
3. The effect of government financial incentives to "jump-start" the NGV market
4. The proper market structure for refueling and other NGV-related services,[25] with the follow-up question of what role utilities can play in providing those services

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[22] Market failures are those barriers to NGV development that prevent vehicle consumers from making rational and socially desirable decisions. They might stem from third-party environmental and national security benefits, as well as the lack of unbiased information on the economics of NGVs compared to other kinds of vehicles.

[23] What, for example, would trigger the public to purchase NGVs over petroleum vehicles and other AFVs?

[24] The low penetration of NGVs might be a rational response of the market to the unattractive economics and other negative features of NGVs compared to other kinds of vehicles. It might reflect, however, a serious market problem in which vehicles drivers are underestimating the private benefits of NGVs or overestimating the costs.

[25] Are refueling stations, for example, natural monopolies or can they operate in a competitive environment? It is reasonable to conclude that refueling stations could operate in a competitive environment assuming a developed NGV market, similar to retail gasoline stations, in the absence of evidence showing significant economies of scale or scope to justify a regulated monopoly. Refueling stations can be either limited-access or public. Limited-access stations

Social benefits of NGVs

1. The environmental and other social benefits of NGVs[26]

2. The social desirability and competitiveness of NGVs compared to electric vehicles

3. The social desirability of a higher penetration of NGVs, along with the most efficient and effective ways to achieve a higher level if found justified

State experiences with NGVs

1. Examples of successes in states that have promoted NGVs

2. Examples of failures in states that have promoted NGVs

Utility role in providing NGV-related services

1. Possible utility roles and the rationale underlying each one

2. Requisite conditions for utility provision of NGV-related services

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offer service only to specific fleets (e.g., city buses, an airport shuttle company). Fleet owners build and operate their own refueling stations to ensure that their vehicles receive fuel when needed. The utility or a third party alone can own and operate them, or they can form a partnership, say, with an oil company.

[26] If these social benefits are substantial, as a policy matter NGV development then should become the purview of the government's energy and environment policies, rather than just a gas utility and commission matter.

III. Using the Information to Reach Commission Decisions

A. Four questions for commissions to ask

State commissions can influence the development of NGVs. Through their policies, commissions can affect the scope of a utility's NGV-related services, in addition to the utility's incentive to provide those services.

In determining cost recovery and the scope of utility involvement, commissions should evaluate the merits of new and underdeveloped technologies like NGVs on the basis of their effects on consumers.[27] They will need to: (a) measure the risks to consumers and utility shareholders, (b) determine how different cost-recovery mechanisms would affect the utility's financial condition and the risks to consumers, (c) conceptualize and measure the benefits and costs of new and underdeveloped technologies, (d) determine the proper market structure for deploying the technology,[28] and (e) determine the effects of consumer education on the market penetration of new demand-side technologies, such as NGVs.

When social benefits from a technology extend beyond those received directly by direct beneficiaries (i.e., social benefits exceed private benefits), commissions might find it appropriate to spread the costs to all customers. Assume that the benefits from NGVs include a cleaner environment for everyone and less dependency on foreign oil. Commissions might approve the recovery from all utility customers of costs associated with promoting NGVs and investing in additional infrastructure. On the other hand, if the utility and NGV customers alone stand to benefit from NGVs, the risks of utility actions should not fall on the general ratepayer.[29] In this instance, a policy of balancing the risks and benefits would require the shareholders and NGV customers to shoulder the entirety of the risks.[30]

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[27] New technologies or underdeveloped technologies like NGVs frequently have potentially high but uncertain benefits to consumers and society.

[28] Would, for example, some NGV-related services be more efficiently provided in an unregulated market or in regulated markets with natural-monopoly features?

[29] Sometimes in other contexts, analysts refer to this outcome as "socializing the risks, but privatizing the benefits."

[30] A utility, for example, might invest in new distribution mains in anticipation of demand growth in NGVs. Compared to other situations, this expectation involves a demand-side technology with a high degree of uncertainty as to its market penetration. Funding this investment from all ratepayers would, therefore, impose an excessive risk upon them.

Table 1: Possible Entities Performing NGV-Market Functions

NGV-Market Function	Possible Providers
Selling of distribution service	▪ **Local gas utility**
Selling of bundled sales service	▪ **Local gas utility** ▪ **Third-party marketers (interstate transportation and commodity natural gas)**
Selling of bundled sales service plus "fueling" service	▪ **Local gas utility** ▪ **Third-party marketers (interstate transportation and commodity natural gas)** ▪ **Third parties (refueling stations)**
Selling or leasing of home refueling appliances	▪ **Local gas utility** ▪ **Third parties (manufacturers, wholesale and retail outlets)**
Dissemination of information on NGVs	▪ **Local gas utility** ▪ **Third parties (auto manufacturers, state or federal agencies, natural gas organizations)**
Marketing of NGVs through promotional and other practices	▪ **Local gas utility** ▪ **Third parties (auto manufacturers, refueling stations, gas marketers)**
R&D activities and funding	▪ **Local gas utility** ▪ **Third parties (auto manufacturers, natural gas organizations)**
Expansion of infrastructure to accommodate NGVs	▪ **Local gas utility (distribution, storage, refueling stations)** ▪ **Third parties (refueling stations)**

Commissions should ask themselves four broad questions. The first pertains to the public-interest aspects of NGVs.[31] Commissions make decisions that serve the general public,

[31] Commissions might define the "public interest" by identifying the multiple objectives that comprise the public interest, assigning weights to those objectives, and resolving the tradeoffs among them. The objectives of an NGV policy might include increased utility throughput and profits, fairness to all customers, efficient pricing of NGV-related services, promotion of competition in the refueling market, a cleaner environment, less dependency on foreign oil, and direct customer benefits from driving an NGV. What commission policy evolves implicitly depends on the relative importance of the objectives and the tradeoffs made. If, for example, a

which might conflict with the interests of individual groups. More utility involvement in promoting NGVs might be good for a utility's shareholders, but bad for customers who fund this promotion but receive no benefits.

The public interest might coincide with a commission policy of encouraging those AFVs that are most economical and socially beneficial, which might not include NGVs. The commission's goal should be to approve those AFV-related expenses and investments that maximize net social benefits, encompassing both fewer air pollutants and improved national security. Greater interest so far lies with electric vehicles than with NGVs. It is unclear at this time whether electric vehicles will turn out to be more economical and socially beneficial than NGVs.[32] Both of these vehicles have promise, but each must overcome major barriers to succeed. Electric vehicles, for example, are expensive relative to petroleum vehicles and NGVs, all-electric cars have less range then other vehicles, customer acceptance is uncertain, and home-based charging stations are costly.

Second, commissions need to ask themselves what is the most appropriate role for utilities in the development of NGVs. Part I.B discusses several roles that utilities can play. Commissions might find preferable utilities' acting only as distributors of natural gas to refueling stations. They might conclude that gas utilities' core function is distribution and that they lack any special business acumen in other functions of the NGV market. In other words, the commission, in addition to determining that distribution has the features of a natural monopoly, might view other NGV-related services as competitive in nature.

Third, commissions should comprehend consumer behavior when it comes to selecting vehicles that have different energy sources. They should, for example, understand the major

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commission assigns a high weight to a cleaner environment, it would tend to spread NGV-related costs to all utility customers, even to those that do not directly benefit from NGVs. On the other hand, if the commission views the benefits as going exclusively to the utility and NGV drivers, it would tend to support a policy that allocates costs only to the utility shareholders or NGV drivers without imposing any direct costs on the general ratepayer.

[32] One study has shown that the life-cycle cost (i.e., the sum of ownership and operating costs) of a Chevy Volt, which is an electric plug-in vehicle introduced to the U.S. market in late 2010, is almost 40 percent higher than the cost of a comparable NGV (Civic GX). Although the Chevy Volt has a lower operating cost, its purchase price is much higher.

The study concluded that:

> Because the incremental cost of owning an EV [electric vehicle] exceeds that of owning an NGV, NGVs are in fact under many scenarios presently more cost effective at reducing greenhouse gases compared to EVs, even though EVs may produce fewer emissions overall. This advantage becomes larger in regions with intensive coal generation or significantly lower natural gas prices. Our analysis shows that unless the purchase price of EVs can be reduced significantly in the short to medium term, *it is likely that NGVs will remain a more cost-effective choice in reducing greenhouse gas emissions.* (Emphasis added) (*See* London Economics Study, at 1.)

factors (e.g., utility promotion, government financial incentives, life-cycle costs, initial vehicle cost) and their relative importance in increasing the penetration of NGVs. With access to this information, commissions can better evaluate the efficacy of a utility's proposal to promote NGVs. As an illustration, if a utility wants ratepayers to fund additional refueling stations and new distribution lines, the commission should know the extent to which these investments will actually increase the number of NGVs. Investments might add little to develop the NGV market if other factors, like the high initial cost of an NGV or the cost of conversions, mostly explain the low use of NGVs.[33] The reader should know that the optimistic outlook for NGVs in the 1990s never transpired. The Energy Policy Act of 1992 (EPAct of 1992) lifted regulatory impediments to NGVs development and also provided financial incentives.[34] Notwithstanding this favorable legislation, in addition to low natural gas prices throughout most of the 1990s, the promising future for NGVs never came to fruition. Commissions should ask themselves: Will history repeat itself?

The fourth question relates to commission policy on ratemaking and the appropriate role of gas utilities in promoting NGVs. Under what conditions should commissions care about a utility's actions in promoting NGVs? Should commissions allow a utility to own and operate refueling stations?

B. Areas of commission inquiry

If commissions deem NGVs to be in the public interest, they should then determine:

1. Whether existing rules and regulations hinder the development of NGVs,
2. The most effective actions to take in removing uneconomical barriers,
3. Whether, to what extent, and how utilities should pursue the development of NGVs,
4. Whether gas utilities should provide NGV-related services as a core function or through an unregulated affiliate, and
5. The effect of utilities' NGV activities on customers and other regulatory objectives (e.g., cost-of-service rates, fair competition).

Concerning uneconomical barriers, appropriate responses might range from doing nothing and providing consumer education to compensating for the barriers by offering

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[33] Another factor might be the low number of available NGVs for prospective drivers. The high cost of modifying petroleum vehicles to use natural gas might continue to be a problem in limiting the availability of NGVs.

[34] *See* Kenneth W. Costello et al., *A Synopsis of the Energy Policy Act of 1992: New Tasks for State Public Utility Commissions* (Columbus, OH: National Regulatory Research Institute, June 1993), at 59-62. The legislation recognized several impediments to NGV development, including state price regulation of refueling stations and other forms of regulation, lack of public information on NGVs, the high cost of NGVs, and the deficiency of refueling stations. One reason for the disappointing outcome was that the federal government decided not to mandate the purchase of AFVs by local governments and private fleets.

prospective NGV drivers financial incentives. Doing nothing is justified when the barriers do not produce large enough inefficiencies to offset the cost of intervention. An analogous situation exists when the government tries to intervene in markets with minor problems. Government policies frequently cause counterproductive results or mitigate a problem at a higher cost than necessary.[35] As an illustration, a commission might want to bolster the NGV market by allowing a utility to offer below-cost leasing rates for home refueling appliances. The aggregate cost of the subsidized rates to customers as a whole might exceed any benefits that arise out of this rate policy. On the other hand, doing nothing might produce inferior market performance when serious market problems exist. If, for example, there is little information on the benefits of NGVs over petroleum vehicles, car buyers could make uneconomical decisions.

State commissions must recognize the important role that they can play in developing the market for NGVs. The extent to which NGVs penetrate the market will depend mostly on economic factors, [36] federal and state environmental and energy policies, technological advancements, and the success of other AFVs. At the least, state commissions should attempt to remove those barriers that would impede the socially desirable development of NGVs. They need to walk a tightrope, however, between encouraging promotion that is excessively costly and risky to ratepayers and standing in the way of justifiable NGV development.

C. Ratemaking criteria

A major task of commissions is to ensure "just and reasonable" rates for services that they have determined the utility should perform. In the context of NGVs, such rates should have the following features:

1. *They reflect the costs of an efficient or prudent utility.* Assume that NGVs require the utility to expand its infrastructure to accommodate NGVs or spend money on educating customers. Commissions should determine that these costs are not excessive before allowing utility recovery. Excessive costs are more likely when the

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[35] *See*, for example, Clifford Winston, *Government Failure versus Market Failure: Microeconomics Policy Research and Government Performance* (Washington, D.C.: AEI-Brookings Joint Center for Regulatory Studies, 2006); and Charles Wolf, Jr., "A Theory of Nonmarket Failure: Framework for Implementation Analysis," *Journal of Law and Economics*, Vol. 22, no.1 (April 1979): 107-39.

[36] Economic factors affect the life-cycle cost of vehicles. The relevant cost is the annual cost of owning, operating, and maintaining vehicles. Cost depends, therefore, on the purchase price of a vehicle, the miles traveled, fuel cost and efficiency, and maintenance cost. Compared to petroleum vehicles, NGVs are more expensive to purchase but cheaper to operate and maintain. In purchasing an NGV, consumers must trade off the higher initial cost for cost savings over time. The same tradeoff exists when prospective consumers are contemplating whether to purchase an electric vehicle or NGV. Electric cars have a higher purchase price than comparable NGVs but lower operating costs. Similarly to energy efficiency in the home, consumers might undervalue energy-cost savings and focus on the initial cost, resulting in uneconomical decisions and overestimation of the payback period. Uncertainty over the operating performance of NGVs and the availability of refueling stations might also discourage the purchase of NGVs.

ratepayers, rather than the utility's shareholders, bear the risks of bad investments and other imprudent utility activities.

2. *They reflect the cost of serving different customer classes and of providing different services.* Deviations from this principle of ratemaking require that commissions articulate the advancement of a specific public-policy or ratemaking objective. Assume, for example, that a commission believes that NGVs should be an integral part of a state energy policy and have observable environmental and national security benefits. It can then justify approving below-cost rates or subsidies that would "jump-start" the market for NGVs. In this instance, price discrimination advances some articulated social objective that the commission deemed would offset the inefficiencies from subsidies or non-cost rates. If utilities want to use ratepayer money to promote NGVs, they should have the burden of proof to demonstrate public benefits or future benefits to funding ratepayers.[37] But even if utilities can show public benefits, an equity problem arises from non-ratepayers' receiving a portion of these benefits without contributing any funds (i.e., being "free riders").

3. *They allow the efficient or prudent utility a reasonable opportunity to earn a rate of return commensurate with its cost of capital.* "Just and reasonable" rates entail commissions' allowing a utility a reasonable opportunity to earn its authorized rate of return when it acts prudently and efficiently. Assume that a utility makes capital investments to expand its distribution system or storage facilities to accommodate NGVs. If the commission previously approved these investments and determined that the utility managed them prudently, it should then allow the utility to earn an adequate rate of return on those investments.

4. *They should reflect fair treatment of the utility's customers and shareholders.* The term "fair" has different meanings. It refers to the treatment of different customers and classes of customers, as well as the utility's shareholders. One interpretation is that a commission's decision determining rates for NGV-related services should not be "arbitrary or capricious." Another is that funding for the development of the utility's infrastructure to accommodate NGVs or spending money in promoting NGVs should balance the risks and benefits. Risk allocation pertains to both the risks among different customers and the risk to customers as a group and the utility's shareholders. Assume that the shareholders and owners of NGVs are the sole beneficiaries of promotional activities. Good regulatory policy dictates that the general ratepayer is held harmless from utility activities to invest and spend other money on accommodating and promoting NGVs.

[37] Third-party or external benefits exist when the pricing mechanism fails to include the social costs from imported oil. These costs include threats to national security and the higher pollutant levels emitted from petroleum vehicles.

D. Specific questions on cost recovery and NGV development

Development and promotion

1. Should commissions develop a policy toward NGVs? If they do, what elements should a policy include (e.g., a specified cost-benefit test, the role of utility affiliates, criteria for cost recovery and pricing)?

2. When are NGVs in the public interest? How can utilities demonstrate this condition to commissions (e.g., that the social benefits of NGVs exceed the social costs)?

3. What role should commissions play in overseeing and approving a utility's plan or strategy for NGVs? Should utilities consider NGVs as part of the integrated resource planning (IRP) process?[38]

4. What role should utilities play in promoting NGVs (e.g., marketing, rate incentives, education,[39] shareholder-funded investments in refueling stations; working and partnering with potential fleet customers, manufacturers of NGVs, and fueling equipment providers)? What are the criteria for utilities to assume a specific role?

5. What role should utilities play in the installation of home refueling appliances?

6. Are refueling stations public utilities with natural-monopoly characteristics? How can commissions know when the refueling business is "workably competitive"?

7. How can a commission create a "level playing field" between utility-owned and third-party refueling stations?[40]

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[38] If commissions do, they might ask: How can utilities justify the development of NGVs when their plan includes energy-efficiency initiatives and pricing that encourage less natural gas consumption? One answer is that residential and other existing customers might be consuming natural gas beyond the level that is socially optimal (e.g., they underestimate the present value benefits from energy efficiency), while gas consumption for NGVs is below the optimal level (e.g., existing drivers of gasoline vehicles should switch to AFVs such as NGVs because they do not account for the higher environmental and "national security" costs of gasoline vehicles).

[39] Whether the gas utility should disseminate information on the merits of NGVs depends on its incentive to distribute unbiased information. Instead, it might be preferable to have the regulator or the state energy office, if they deem the growth of NGVs to be in the public interest, disseminate this information. On the other hand, if commissions found it appropriate for utilities to promote NGVs, disseminating information might be an integral part of that activity.

[40] This question presumes that, especially in a nascent NGV market, the preferred policy is to allow the coexistence of utility-owned and third-party refueling stations. An "uneven playing field" in favor of the utility can discourage entry by third parties and forestall the time that refueling stations could compete with each other.

8. What role should gas utilities play in the refueling function (e.g., deliver gas to a refueling station owned by a third party or to a self-owned refueling station; utility partnership with gasoline service-station owners)? When should utilities leave the NGV refueling business?[41] Would the NGV market develop more quickly and competitively without gas utilities' owning refueling stations?[42]

9. Under what conditions should commissions allow a utility affiliate to provide refueling and other NGV-related services? What general policy should commissions have toward diversification by the utility's parent company or the utility itself into the NGV market?[43]

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[41] A legal question is: Does state law grant a commission authority over the resale of natural gas (e.g., by a third-party operator of a refueling station)? If so, then the follow-up question is whether federal law preempts state law. Some commissions have ruled that the EPAct of 1992 preempts state law in the sale of natural gas for use as a vehicle fuel unless a contrary state provision was in place. Specifically, EPAct of 1992 stipulates that the transportation or sale of natural gas for use in NGVs by any entity not otherwise a public utility shall not be considered a transportation or sale of natural gas within the meaning of any state law and regulation in effect before January 1, 1989. (*See* Kenneth W. Costello et al., *A Synopsis of the Energy Policy Act of 1992: New Tasks for State Public Utility Commissions* (Columbus, OH: National Regulatory Research Institute, June 1993), at 59.

In Idaho, the Public Utilities Commission ruled that the term "public utility" includes those persons or entities who "in turn deliver or resell a utility commodity (e.g., natural gas) to the public or some portion thereof for compensation." The commission, however, ruled that EPAct of 1992 gave the federal government supremacy over state law with regard to the resale of natural gas for vehicles. (*See* Idaho Decision) The California Public Utilities Commission, as another example, has ruled that persons operating service stations that resell compressed natural gas for vehicular use, other than public utilities, are not subject to rate regulation by the commission.

[42] If the utility-owned station receives ratepayer funding and other regulatory-approved advantages, other entities might decide not to compete. The outcome would likely result in a smaller number of refueling stations in the long term.

[43] One related question is: If a commission allows a gas utility or its parent to own and operate a refueling station, should the station operate as a separate unregulated affiliate or as part of the regulated utility?

Cost recovery and ratemaking

1. What is the appropriate ratemaking method for NGV-related services provided by a utility (e.g., cost of service, promotional rates, separate rates for customers with home refueling appliances)?[44]

2. Who should pay for initial infrastructure development? If ratepayers fund this development, how should utilities recover the expenditures? Should commissions limit recovery to "start-up" activities that would help bolster the NGV market?

3. Who should pay for any NGV promotional or development costs (e.g., R&D expenditures, marketing, customer education)?

4. How should commissions treat the costs associated with home refueling appliances (e.g., rate-basing, lease agreement between the utility and the customer)?

5. How should commissions treat the costs associated with central refueling stations owned by the gas utility?

6. How should commissions review those utility costs paid to an affiliate for the provision of services associated with NGVs?

[44] Home refueling appliances allow NGV owners to refuel their vehicles overnight in their homes, from their existing natural gas line. Residential customers with a home refueling appliance would tend to have higher annual load factors (i.e., a higher ratio of average usage to peak demand) than other residential customers. Utilities can, consequently, serve those customers at a lower average cost, and thereby economically justify charging them a lower rate than other residential customers.

Appendix: The Current Status of NGVs and Their Outlook

Where Do NGVs Stand Today?

NGVs currently have a minor presence in the U.S. transportation market. NGVs account for only about 110,000 of the 250 million motor vehicles in this country.[45] They originate either from new vehicles produced by an original equipment manufacturer (OEM) or the conversion of existing gasoline or diesel vehicles to NGVs.[46]

The majority of NGVs are either heavy-duty vehicles that travel limited distances (e.g., transit buses, school buses) or other fleet vehicles, such as refuse haulers, taxis, utility vehicles, and delivery trucks. Compared to petroleum vehicles, NGVs have (1) limited refueling availability, (2) higher vehicle costs, (3) shorter driving ranges, and (4) heavier fuel tanks. The combination of these factors largely explains the limited acceptability and use of NGVs in the U.S.

Most of the attention paid to AFVs so far has centered on electric plug-in and hybrid vehicles. Surprising to some readers, electric vehicles have higher life-cycle costs than NGVs.[47] Although electric vehicles do not directly consume fossil fuels that emit pollution, the incremental production of electricity might involve the burning of fossil fuels, such as coal. If state commissions encourage the promotion of electric vehicles, should they not have the same policy toward NGVs? Like electric vehicles, NGVs will reduce our dependency on foreign oil as well as contribute to a cleaner environment.

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[45] *See* RFF Study. In the same year, natural gas accounted for just 0.2 percent of the fuel used by all highway vehicles.

[46] Conversion of a gasoline or diesel fuel vehicle to an NGV requires changes in the fuel storage tank, the fueling receptacle or nozzle, and the engine. EPA regulations, according to some observers, have made conversions uneconomical. Vehicle owners consider conversion costs as upfront costs that they compare with the discounted fuel-cost savings and other benefits from conversion.

[47] *See* study cited in footnote 32.

With regard to the economic factors affecting NGVs, an MIT study explained that:

> The economic attractiveness of CNG [compressed natural gas] vehicles is determined by vehicle incremental cost, mileage driven per year and gasoline-CNG fuel price spread... Previous studies have shown that payback times of three years or less are needed for substantial market penetration. For recent fuel price spreads, low vehicle incremental cost (e.g., $3,000) and high mileage are necessary to meet this requirement. Also, the rate of penetration of CNG vehicles, even if economic, will depend on the provision of refueling infrastructure.[48]

A big challenge for NGVs is expanding the refueling infrastructure to include more stations and other sources of refueling.[49] Another challenge is narrowing the price difference between a conventional vehicle and an NGV. Overcoming the first challenge will demand a much higher number of NGVs to economically justify the building of more refueling stations. But achieving that would first require the building of more refueling stations—a classic chicken-and-egg problem that might justify some form of governmental or utility assistance. The second challenge might require government incentives to lower the purchase price of an NGV and stimulate the building of new refueling stations.[50]

In its *Annual Energy Outlook 2010*, the U.S. Energy Information Administration (EIA) highlighted obstacles that NGVs face in the heavy-duty market:

> Despite the price advantage that natural gas has had over diesel fuel in recent years (an advantage that is projected to increase over time in the Reference case), other factors—including higher vehicle costs, lower operating range, and limited fueling infrastructure—have severely limited market acceptance and penetration of natural gas vehicles...In addition to concerns about driving range and refueling, the residual value of HDNGVs [heavy-duty natural gas vehicles] in the secondary market is likely to be an important consideration for buyers. Also, purchase decisions can be influenced by other factors, such as weight limits on highways and bridges, which can make the considerable additional weight of CNG or LNG tanks a significant drawback in some market segments...The importance of range and refueling infrastructure barriers suggests that the best near-term market penetration opportunity for HDNGVs, some of whose incremental costs are already covered by tax credits, could be in *the market for*

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[48] See The Future of Natural Gas, at 51.

[49] An adequate infrastructure would also include maintenance and repair shops for NGVs.

[50] Tax incentives and other financial inducements have greatly assisted in the nascent development of alternative fuel vehicles (AFVs). Bipartisan support for NGVs and other AFVs will likely extend and expand governmental assistance in the future. But the current political environment might erase some if not all assistance, for budgetary reasons if for no other reason. Incentives under debate in the U.S. Congress at the time of this writing encompass fuel, infrastructure, and vehicle tax incentives. The fuel tax incentive expired at the end of 2009, and the other two tax incentives will expire at the end of 2010.

centrally fueled fleets that operate primarily within a limited distance from their base.[51] [Emphasis added]

The market barriers identified earlier, however, do not necessarily represent market failures or problems that justify subsidies or other forms of governmental or utility assistance. In different contexts, market dynamics through technological improvements and better consumer information are often sufficient for mitigating, if not eliminating, these barriers.

The Outlook for NGVs

Electric plug-in and hybrid vehicles so far have received the most attention, but the situation could change in the future if NGVs and biofuels overcome certain obstacles and become more economical and acceptable to future vehicle owners.

The consensus among experts is that NGVs and electric vehicles can coexist to displace a portion of the market for conventional vehicles in urban fleets. The most promising markets for NGVs, based on the latest evidence, are commercial and government fleets. Specifically, NGVs' best bet is high-mileage urban (light and heavy) fleets with central refueling. The economic attractiveness of NGVs, compared to conventional vehicles, depends significantly on the life-cycle fuel savings. Fuel savings, in turn, hinge on the price spread between natural gas and gasoline or diesel fuel in addition to the number of miles driven.

The niche market for electric vehicles is the light-duty market.[52] NGVs and electric vehicles, therefore, have complementary features that together can reduce our dependency on foreign oil and improve our environment. Few analysts foresee NGVs as the predominant vehicle in any of the transportation markets. Almost all predict that petroleum vehicles will continue to dominate the motor vehicle market in the U.S. for the foreseeable future.[53]

Some analysts point to the likelihood that electric vehicles will increase the demand for natural gas more than NGVs will, to the extent that the additional electricity production will come from gas-fired generating facilities. The energy consulting firm IHS CERA expressed this view in a recent report:

> The infrastructure needs and higher costs will likely limit significant growth in natural gas vehicles…Very significant policy support would be needed, which

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[51] *See* EIA Analysis, at 33.

[52] According to most experts, NGVs as passenger cars are unlikely to develop as much as electric vehicles. Semi-trailer trucks are also unlikely candidates for natural gas. In one sense natural gas can produce large benefits because these trucks have high mileage and low fuel economy—features that would account for high fuel-cost savings from using natural gas. Because of their limited range, however, gas-fueled trucks would have to make more fill-ups, which truckers traveling long distances might find unacceptable.

[53] One exception is if the U.S. adopts stringent greenhouse gas legislation, which seems remote at the time of this writing. Such legislation could dramatically drive up the cost of gasoline and diesel fuel, at least relative to natural gas and other sources of energy that emit less carbon dioxide.

would compete with policy support for higher efficiency, biofuels, and electric vehicles. The most likely growth market for natural gas in transportation would be through the electric power sector.[54]

A report by Resources for the Future (RFF) identifies several challenges that NGVs face:

> Yet even proponents of natural gas concede that these vehicles [NGVs] face significant obstacles to capturing a major share of the market. Irrespective of the vehicle type, there are concerns regarding economics—the equivalent gasoline or diesel vehicle is cheaper, although fuel costs are likely to be higher—as well as concerns about safety and availability of refueling stations. The latter is the "chicken and egg" problem: Vehicle users will not buy NGVs until they believe there are enough refueling stations, but there is little motivation to build an NGV refueling infrastructure until a sufficient number of vehicle owners demand the fuel. There are other concerns as well. The cruising range and cabin space of light-duty vehicles may be insufficient. Heavy-duty trucks may also have inadequate range unless they are fueled by liquefied natural gas (LNG). Intermediate weight trucks, buses, and refuse trucks already use natural gas in significant numbers, but represent a relatively small market.[55]

Economic assessments have shown that all AFVs will continue to require financial and other forms of subsidies for an indefinite period to have a discernible presence in the transportation market.[56] The NGV market, for example, will need assistance to reduce the price of NGVs and stimulate the development of fueling stations. The hope is that new technological advancements will ultimately make NGVs competitive with petroleum vehicles.[57] These advancements can lower the weight of the vehicle tank, as well as the cost of conversion kits and refueling stations. Another hope is that the cost of NGVs will substantially decline as the scale of production increases.

Increased penetration of NGVs should occur simultaneously with the availability of additional refueling stations.[58] Increased vehicle production should lead to higher demand for NGVs, as economies of scale would drive down vehicle prices.

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[54] *See* IHS CERA Study, at ES-7.

[55] See RFF Study, at 2.

[56] One exception to the need for continued subsidies is if the price of gasoline and diesel fuel soars to extremely high levels. Another exception is if the country enacts a stringent carbon policy that would drive up petroleum prices relative to natural gas prices.

[57] NGVs are a mature technology that has gained wide support in several countries. The technological improvements referred to here are mostly incremental in nature with the effect of making NGVs more economical.

[58] A higher number of refueling station can overcome what some refer to as the "range anxiety." This condition, which constitutes a major barrier to NGV development, exists because of drivers' concern over finding stations to refuel when necessary. NGVs have a shorter range

A factor in favor of NGVs over petroleum vehicles is the expectation of a growing gap between natural gas and oil prices in the future. Most forecasts call for the ratio of oil to natural gas prices to rise between 2010 and 2030.[59] This increase should enhance the economic attractiveness of NGVs.

NGVs will also become more competitive if Congress passes legislation on carbon dioxide restrictions. AFVs as a whole would benefit from driving up the cost of operating petroleum vehicles relative to electric vehicles and NGVs. A business-as-usual world, according to most analysts, would not result in rapid growth of NGVs in the U.S. transportation market. A MIT study, for example, projected that:

> Development of the U.S. vehicular transportation market using compressed natural gas (CNG) powered vehicles offers opportunities for expansion for natural gas use and reduction of CO_2 emissions, but it is unlikely in the near term that this will develop into a major new market for gas or make a substantial impact in U.S. oil dependence. However, significant penetration of the private vehicle market before mid-century emerges in our carbon-constrained scenario. Liquefied natural gas (LNG) does not currently appear to be economically attractive as a fuel for long-haul trucks because of cost and operational issues related to storage at -162 degrees Centigrade.[60]

Finally, a big challenge for NGVs is convincing the general public that NGVs are "green," similarly to the way in which many people perceive hybrid vehicles. Hybrid cars have become popular even though to many owners they are not economical. One important reason is that people want to show their neighbors, friends, and others that they are contributing to a cleaner environment. In other words, many people purchase hybrid cars for non-economic reasons. Would they buy NGVs for the same reasons? At this point, the jury is still out. Consumers might shift toward NGVs in moderate numbers if the economics change in favor of NGVs over other AFVs and petroleum vehicles.[61]

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than comparable gasoline or diesel-fuel vehicle because of increased vehicle weight and the lower energy density of natural gas. A larger fuel tank can increase the driving range of an NGV, but at the loss of fuel efficiency, cargo space and payload.

[59] *See*, for example, U.S. Energy Information Administration, *Annual Energy Outlook 2010*, May 2010.

[60] *See* The Future of Natural Gas, at xiv.

[61] Even if the economics are favorable, consumers might still not shift to NGVs. They might, for example, have less-than-adequate information on the economic benefits of NGVs. Inertia can also inhibit them from switching to a non-petroleum vehicle even when it would be in their self-interest. Finally, consumers might focus on the initial higher cost for NGVs, paying inadequate attention to the life-cycle cost. Responding to these market problems might justify governmental and utility intervention.

EXHIBIT __(KTV-4)

The Compelling Case For NGVs in Fleets

(and the potential for consumer market adoption)

Work product of
Stephe Yborra - Director of Market Development
NGVAmerica

Director of Market Analysis, Education & Communications
Clean Vehicle Education Foundation

(last updated September 4, 2014)

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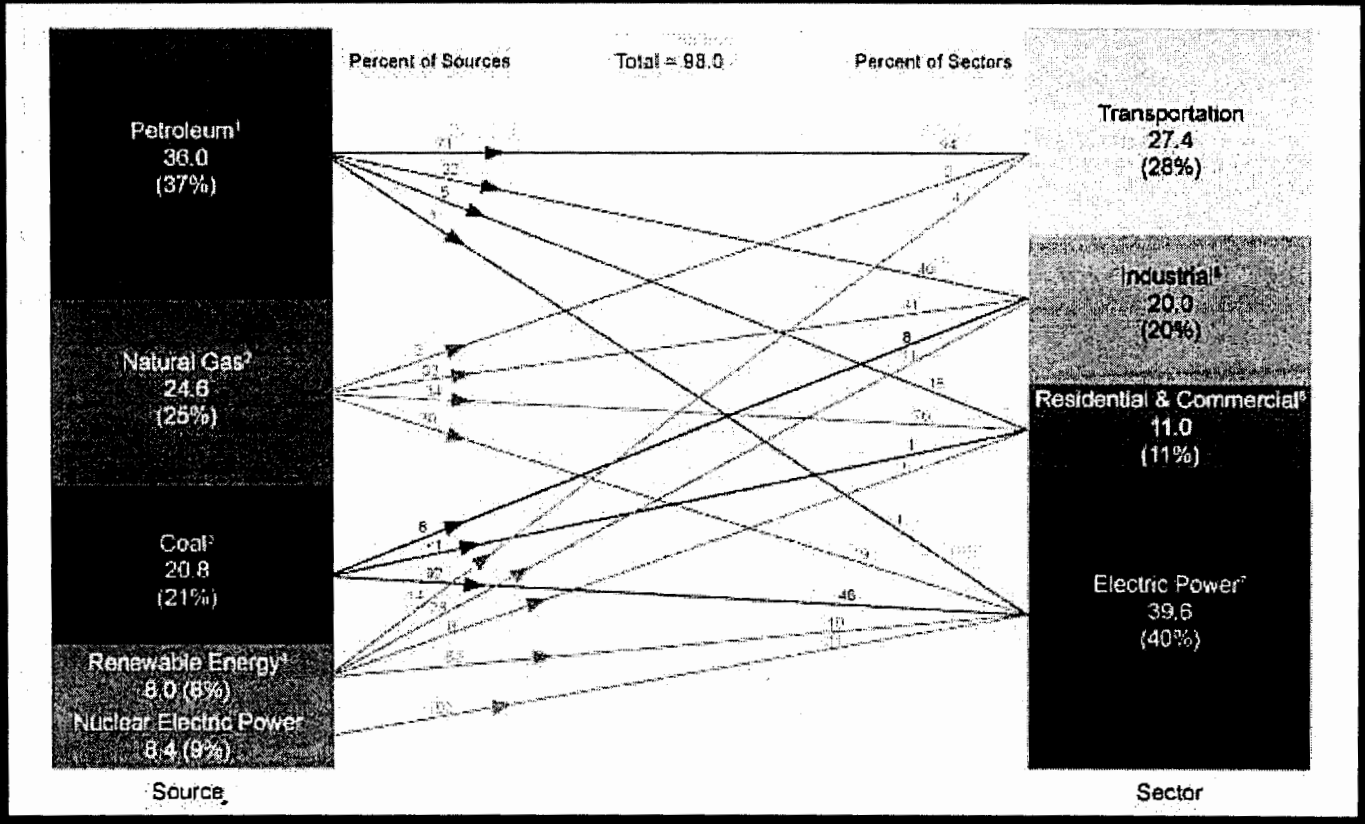
Snapshot of Energy Supply and End Use



- Transportation (on-road, off-road, rail, marine and aviation) = ~28% of all energy use
- ~71% of all oil is for transportation
- On-road vehicles account for ~60% of all petroleum use

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What is the Compelling Case?

- Environmental, energy security and – now, more than ever due to domestic natural gas abundance - ***economic*** market drivers are behind the trend toward greater use of NGVs. While fleet fuel use has been the primary focus, potential consumer market is now spurring additional investment in infrastructure.

- A growing selection of light-, medium- and heavy-duty NGVs are available from OEMs and SVMs, delivering performance and reliability that are on par with gasoline and diesel counterparts.

- A variety of fueling options are available – LDCs, E&Ps, leasing companies, other customers and independent fuel retailers – both NGV-focused and, now, more traditional fuel retailers - are engaging to develop fueling infrastructure.

- Natural gas is America's fuel: America's resource, America's jobs. Reduced reliance on volatile foreign oil supplies = Energy Security

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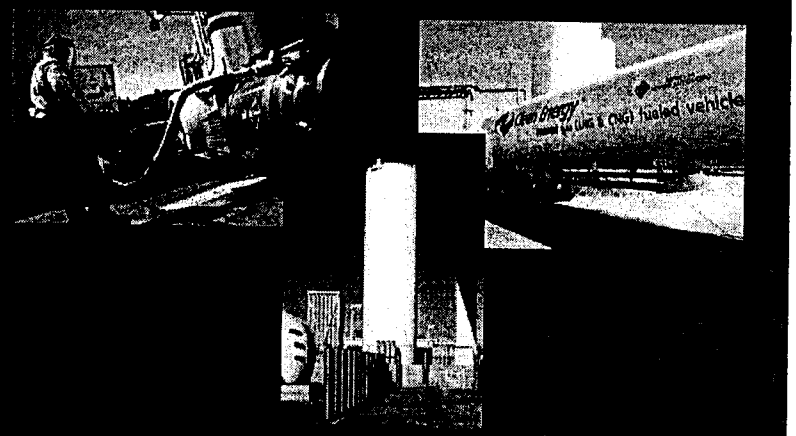
Overview of LNG / CNG

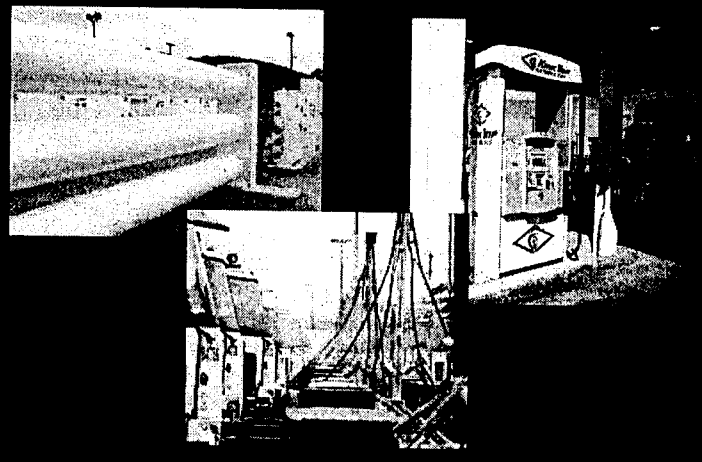
Liquefied Natural gas (LNG)

- Cryogenically cooled natural gas @ ~(260)F; high energy density -> reduced space requirements; "use it or lose it" fuel -> minimize heat/pressure gain to avoid fuel loss.
- Stored in liquid form onboard vehicle, vaporized before it enters engine.
- Presently used in heavy-duty fleets only.
- Also option for locations without pipeline gas.



Compressed Natural gas (CNG)

- Low pressure utility gas piped to station, then compressed and 1) stored in 4500+ psi pressure vessels in advance for fast fill of vehicles or 2) delivered to vehicles' onboard storage cylinders at 3600 psi (time-fill).
- Vehicle cylinder op. pressure: 3600 psi



Snapshot of US NGV Market Today

- Existing NGV inventory: ~150K (as of August 2014)
  - ~37,000 HDVs
    - 11,000 buses
    - 5,500 school bus
    - 8,000+ refuse
    - 7,500 ports/regional haul
    - 5,000 muni/F&B/Misc
  - ~88,000 LDVs (fleet and consumer)
    - Cars/SUVs, p.u. trucks/vans
  - ~25,000 MDVs
    - 9,500 gov't
    - 2,00 package delivery
    - 3,000 airport/university/ community shuttle
    - 10,500 utilities, F&B, comm. services, household goods, construction, misc
- 2012: ~17,450 NGVs added to US roads (net gain of ~10K vehicles)
- 2013: ~19,600 NGVs added (net gain of ~ 12K vehicles)
- 2014: ~24,000 production projected (net gain: ~15-18K vehicles)

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Independent Forecasts

- Widely varying estimates of future growth but ALL are bullish
  - Frost & Sullivan:
    - By 2017, 8% of ~370K Class 6-8 truck market (30K trucks)
    - Doesn't even factor in Class 3-5 market (step vans, small box trucks, c/c utility work trucks, shuttles)
  - National Petroleum Council (NPC) study: Under "aggressive" (high oil price) scenario shows, by 2050
    - ~50 percent of LD market
    - ~35 percent of Class 3-6 truck market
    - ~50 percent of Class 7-8 truck market
- Even if we fall short of optimistic projections, growth is still phenomenal

Snapshot of US NGV Market Today

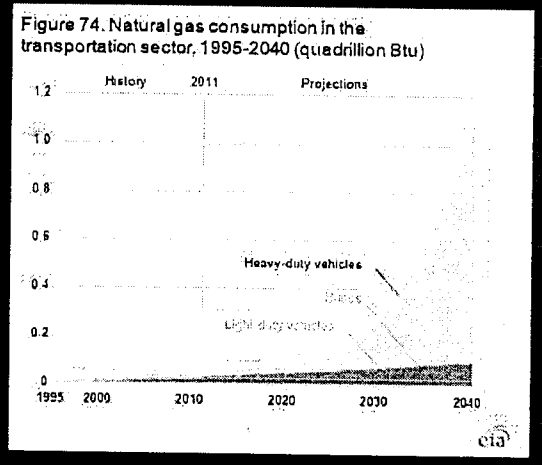
- Vehicular natural gas consumption :~10-15% AGR past 7 years
  - 2005: ~200MM GGE
  - 2011: ~325MM GGE
  - 2012: ~350MM GGE
  - 2013: ~400MM GGE
  - 2014: likely 500+MM GGE as more MDVs and HDVs hit the road

  - Factors affecting future growth and timeframe include pace of worldwide economic recovery, continued petroleum-natural gas differential, expanded engine/vehicle choices, policy/regulatory framework
  - Vehicle, fuel and station tax credits, grants can accelerate adoption

Energy Use in On-Road Transportation

- Total on-road transportation energy usage translated to natural gas volumes: 21.97 Tcf (based on 2010 PDD data):
  - Heavy-duty freight: 4.41
  - Commercial light trucks: 25% 0.59
  - Buses: 0.27
  - Light-duty: 16.7

- Widely varying forecasts but ALL point to "hockey stick" growth curve →
  Ex:
  - US DOE EIA forecast: 1.2 Tcf by 2040
  - PIRA Consulting: 5.1 Tcf by 2030 (= 24% of today's on-road energy use)
  - Other independent forecasts fall between these two extremes



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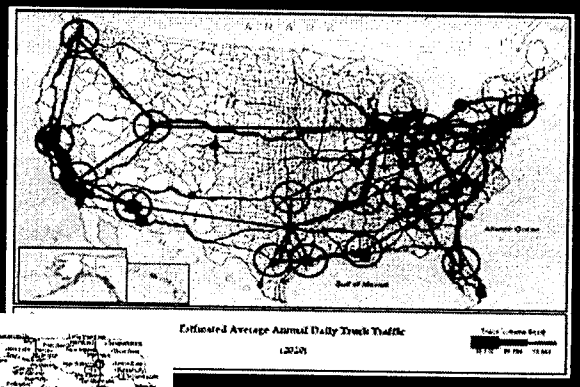
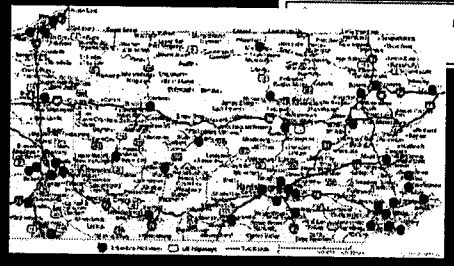
Snapshot of US NGV Market Today

- Station count: ~1520 after steadily growth in past 36-48 months
  - 2013: ~250 new stations. 2014: 20-30 stations/month
- Growth in installed capacity far greater than growth in station counts.
  - Newer stations tend to be larger, based on better economics of "anchor loads" or aggregated loads; some existing stations upgraded to meet load demands
- About half are "public access;" emphasis today is on upgrading experience to meet public expectations.

- Co-development of metro hub-and-spoke and corridor networks. CNG capturing most of local hub and spoke and many regional and super-regional trucking applications.
- Increased LNG infrastructure is in place and expanding to serve growing list of long haul OTR operators on Interstates





Hypothetical PA example based on key pop. centers, travel patterns:

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Multiple Stakeholders Are Engaging NGV Fueling Infrastructure Development

- Local gas distribution cos. (LDCs)
- Natural gas retail fuel sellers
- Gas exploration & production cos.
- Leasing companies
- Customers
- "Traditional" fuel retailers
  - C-Stores
  - Truck Stops
  - Grocery/Warehouse stores

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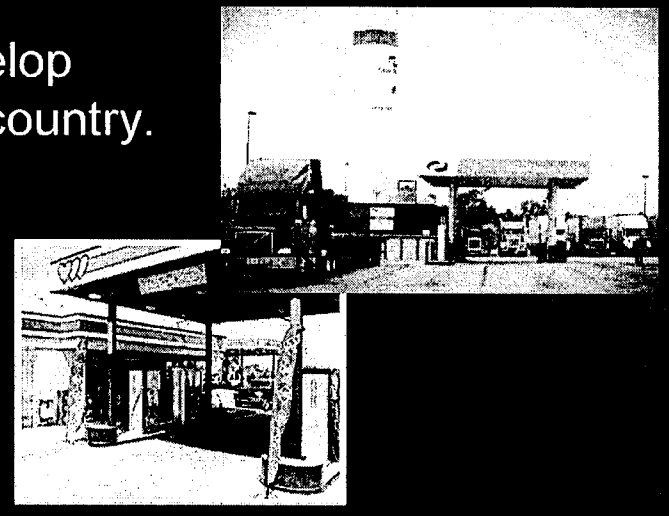
Truck Stops Are Embracing Public-Access Fueling Infrastructure

- Pilot/Flying J partnered with Clean Energy to develop LNG (and potentially L/CNG) stations across the country.
- Love's is developing CNG locations in the Midwest and South Central regions.
- TravelCenters of America/Shell partnership to install LNG capability at 100 locations
- Trillium, TruStar, GAIN, Questar, Nuovo, and other station developers currently partnering with more than a dozen additional TSO chains and independents to install natural gas fueling capability



C-Stores Are Embracing Public-Access Fueling Infrastructure

- Kwik Trip has installed LNG and CNG dispensing capability at its central warehouse/HQ in LaCrosse, WI and adding CNG and/or L/CNG at additional 35+ retail locations throughout their 3-state trading area (KT's fleet is serving as its own "partial anchor load")

- OnCue Express has built multiple locations in OK and AR.... focus is on light-duty commercial and retail consumer sales.

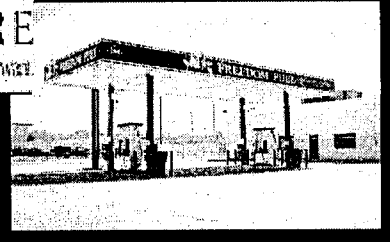
- Additional C-store chains are in process of evaluating and/or installing similar options either alone or in partnerships.

Customers Are Embracing Public-Access Fueling Infrastructure

- Waste Management has been co-developing retail locations under the Clean-N-Green brand. WM fleet serves as anchor load inside the fence (primarily time fill) while promoting to public outside the fence (and extending their "green" messaging)

- Transit agencies, municipalities, F&B companies, other small businesses are collaborating with other fleets to aggregate load to meet critical throughput thresholds.

Ivan Smith FURNITURE



NOVUS WOOD GROUP

CNG

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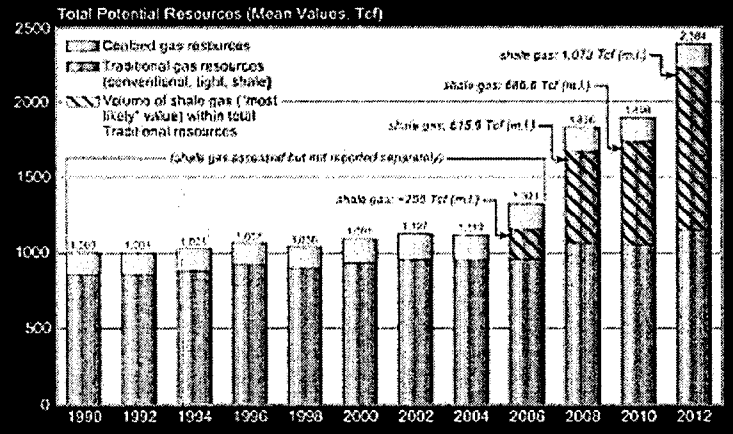
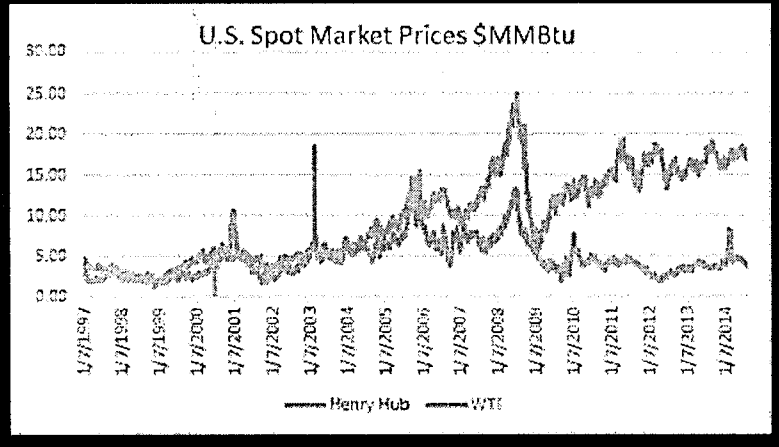
Natural Gas Abundance Drives Price Differential

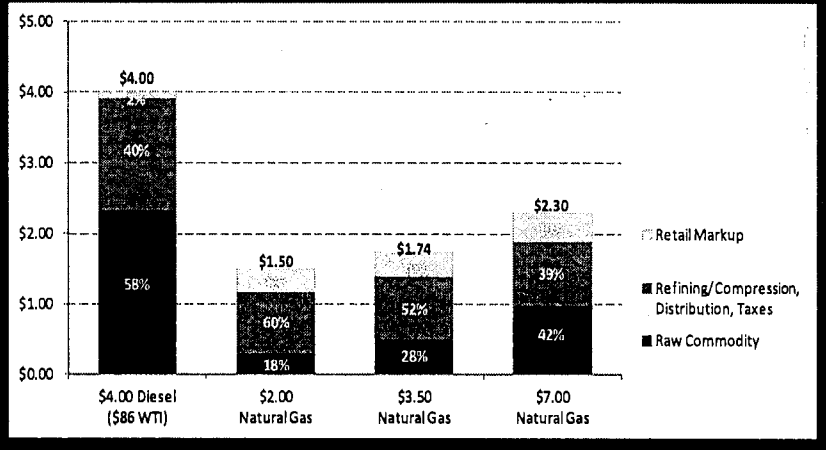


PGC Resource Assessments, 1990-2012

- **Technology improvements are expanding our economically recoverable base so much so that the estimated supply is now @ 115+ yrs!**
- **Natural gas and crude oil decoupled in 2008; favorable differential likely to remain/improve well into future**
- **Major difference between crude oil and natural gas as % of total fuel cost**



NG and Crude Oil Prices 1997-2014



Impact of base commodity on pump fuel price

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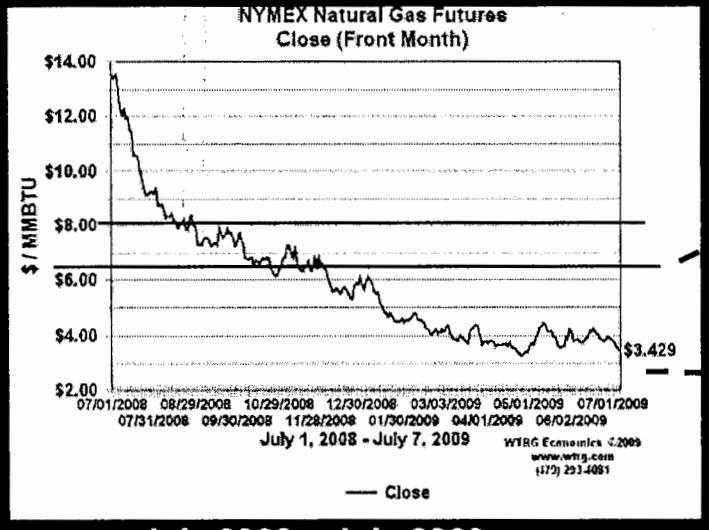
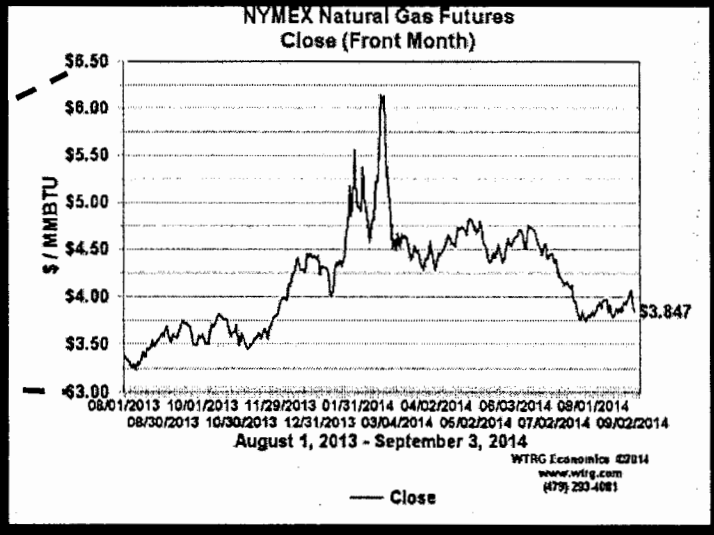
Translating Abundance into Savings



July 2008 – July 2009



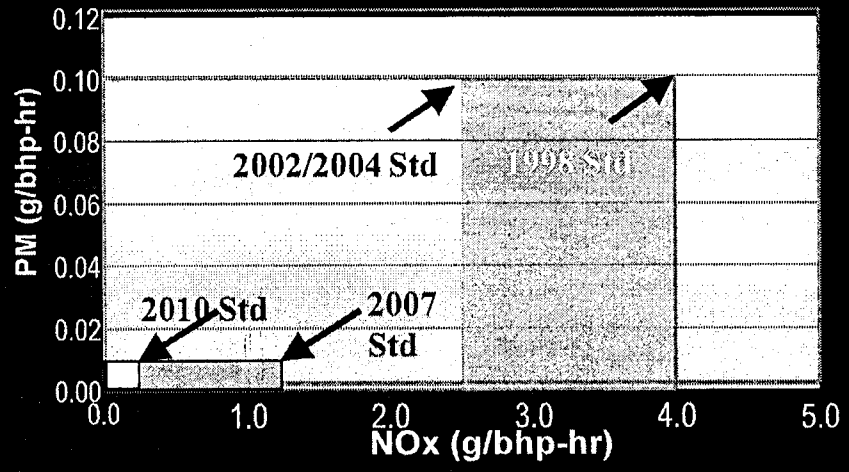
Aug 2013 – August 2014

One MMBtu is ~8.0 GGE of (uncompressed) natural gas
One MMBtu is ~7.2 DGE of (uncompressed) natural gas.

- 2013 NYMEX MMBtu averaged $3.70; $.46/GGE ($.52/DGE).
- 2013-2014 “polar vortex” winter saw temporary escalation of cost/MMBtu
- Add costs of acquisition, regulated delivery tariff, compression electricity, maintenance, capital amortization and you still get $1.50-1.90/GGE + tax depending on where in the US station is located

Emissions/AQ/Climate Change is a Market Driver of Change

- NAAQS, EPA Vehicle Requirements addressing criteria pollutants



- Diesel exhaust treatment strategy (DPF+SCR) has increased HDV purchase price and O&M cost, added complexity.
- **NG HDVs achieved 2010 requirements in 2007 w/o use DPFs/SCR**; maintenance-free TWC exhaust treatment system

- Latest focus is on greenhouse gas (GHG) emissions.
  - Phasing in vehicle GHG requirements: LDVs (2014); HDVs (1st 2013; next phase-in is 2018)
- **NGVs reduce GHGs significantly**
  - CEC study: 20-29% (HDVs: 20-23%; LDVs, 26-29%)
  - EPA GREET model: 15-20+%

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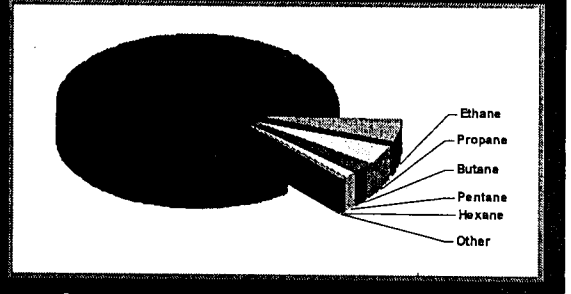
Energy Security and Diversity is a Market Driver For NGVs

- Diversifying America's Transportation Fuel Portfolio
  - Electricity
    - All-electric
    - Hybrids, PHEVs
  - Bio-diesel (B100) and blends
  - Ethanol
    - E85 (limited production/distribution – majority is in Midwest market)
    - Oxidant additive to gasoline (e.g. E10 gasoline – perhaps to be increased)
  - Propane
  - Natural Gas
  - Hydrogen
    - Internal combustion engines (H/CNG blends like Hythane)
    - Fuel cells (eventually)

Natural Gas and the Hydrogen Future

- Natural gas and NGVs are the logical energy pathway and technology bridge to the hydrogen transportation energy future
  - Natural gas is 87-95% Methane
  - Methane is CH4 - 80% Hydrogen
  - Reform at station or on-board
  - H/CNG blending in internal combustion engines is likely precursor to wider use of H2
  - Market acceptance of gaseous fuel compression, storage vessels, engine maintenance
  - NGV industry is spearheading Codes & Standards development

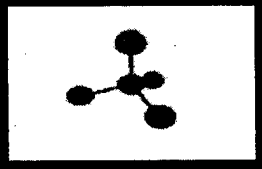
Methane Molecule



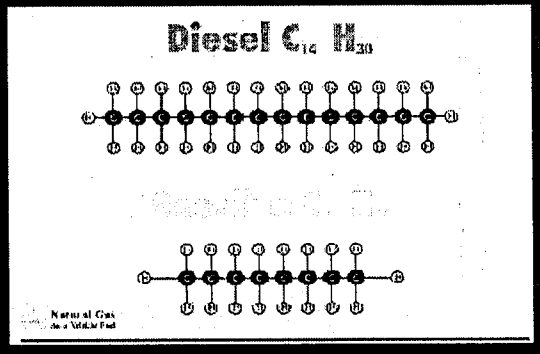
- Still a LONG way to go before H2 vehicles are commercially viable and represent significant impact

Benefits of Natural Gas/NGVs

- Natural gas is an inherently clean fuel
  - Natural gas is low-carbon fuel (CH4)
  - Less NOx, PM and GHGs
- Natural gas is very safe
  - Lighter than air; Limited combustion ratio (5-15%)
  - High ignition temperature: 1000+F
  - Colorless, odorless, non-toxic substance
  - Doesn't leak into groundwater
- NGVs are proven and reliable
  - 16+ million worldwide;
- NGVs are quiet
  - HDVs are 80-90% lower db than comparable diesel
- NGV life-cycle costs are significantly lower
  - Fuel costs are far lower!
  - Maintenance costs are =/< than gas or diesel



Methane Molecule



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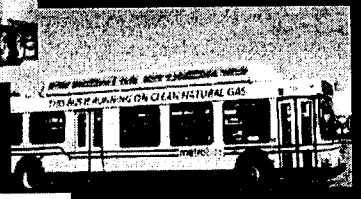
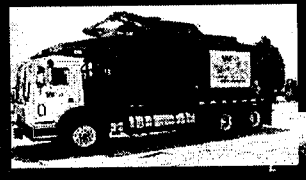
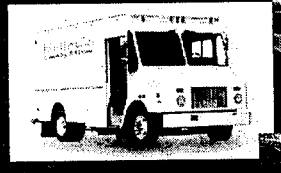
Key Attributes and Best Prospects



- High fuel use vehicles with return-to-base operations or repetitive route or pre-set geographic operating areas

-Regional / long haul freight truck – 18-25K DGE
-Transit buses – 12-15K DGE
-Refuse/Concrete trucks – 7.5-10K DGE
-Municipal sweeper – 5-6K DGE
-Airport shuttle service – 5.5-7.5K GGE
-Local goods/svcs: F&B, Textiles etc – 7-10K DGE
-Taxi - 4.5-5.5K GGE
-School Bus – 2.5-3K GGE
-High-mileage pick-up 2-2.5K GGE
-Courier sedan, newspaper van, utility/ telecom van, public works pick-ups – 1.2-1.5K GGE

- Consumers have already shown that they will adopt given sufficient infrastructure, despite less attractive economic value proposition

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Growing Selection of NGVs from OEMs, SVMs

HD Truck OEMs

- Freightliner Truck
- Volvo
- International
- Kenworth
- Peterbilt
- Mack

HD Vocational OEMs

- Mack
- Peterbilt
- Crane Carrier
- Autocar Truck
- ALF Condor
- Elgin
- Johnston
- Schwarze
- Tymco
- Capacity
- Ottawa

HD Bus OEMs

- Thomas Built Bus
- Blue Bird Bus
- Optima/NABI
- El Dorado
- New Flyer
- Motor Coach Ind.
- Gillig
- DesignLine

HD Retrofit/Repowers

- American Power Group
- Clean Air Power
- Fyda Energy Solutions
- NGV Motori
- Omnitek Engineering
- Diesel 2 Gas

Dual fuel retrofits and SING repowers of Cummins, Daimler, Navistar, Detroit Diesel, Mack, Volvo, Caterpillar

LD OEMs

- American Honda
- General Motors
- Chrysler Ram Trucks
- Ford*

LD/MD Retrofits*

- Altech-Eco
- Landi Renzo/Baytech
- IMPCO Automotive
- Westport/BAF Technologies
- NGV Motori USA
- NatGasCar
- AGA Systems
- Greenkraft
- PowerFuel Conversions
- World CNG

Retrofits of GM, Ford, Dodge, VW, Mazda, Mitsubishi, Workhorse, Isuzu, JAC, Freightliner Custom Chassis platforms

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LDVs Available from OEMs

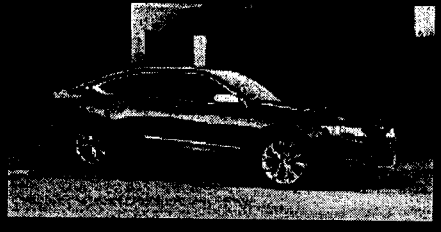
Honda Natural Gas Civic Sedan (dedicated)

GM Silverado/Sierra pick-up (bi-fuel)

GM Express/Savana Cargo & Passenger Vans (dedicated)

Ram 2500 dual-cab pick-up (bi-fuel)

NEW! MY 2015 Bi-fuel GM Impala (late summer 2014)



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LDVs, MDVs Available Through SVMs

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OEM HD Natural Gas Powertrains

CWI 8.9L ISL-G	CWI 11.9L ISX-G	(earliest 2016) Volvo 13L D13	(4thQ 2015) CWI 6.7L ISB-G	(2016?) Cummins 15L ISX-G
		?	?	?
Spark Ignition	Spark Ignition	Diesel Pilot	Spark Ignition	Spark Ignition
CNG or LNG	CNG or LNG	LNG Only	CNG or LNG	CNG or LNG
Peak Rating:	Peak Rating:	Peak Rating:	Peak Rating:	Peak Rating:
320 hp / 1,000 ft-lbs	400 hp / 1,450 ft-lbs	455hp / 1750 ft-lbs	~260 hp / ~660 ft-lbs	hp /torque TBD

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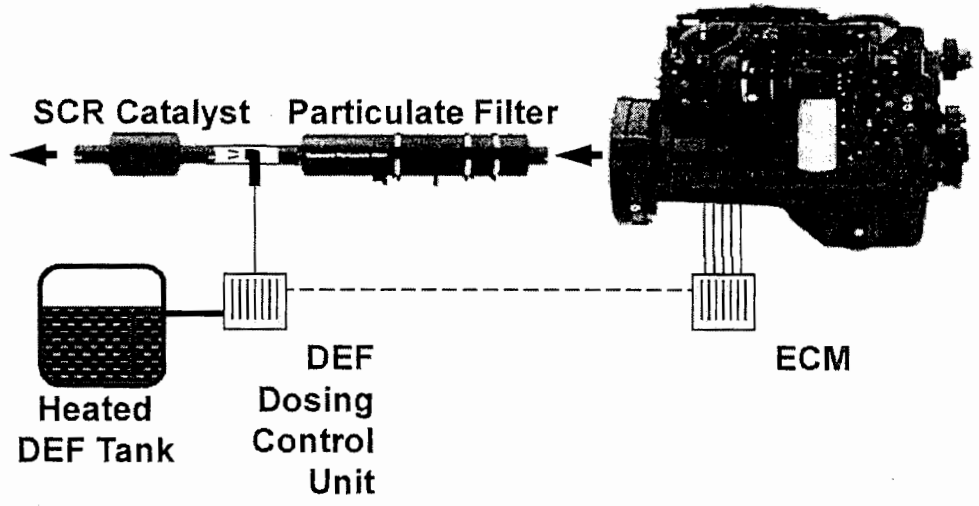
Exhaust After-treatment Comparison of Diesel vs S.I.N.G.

ISL9

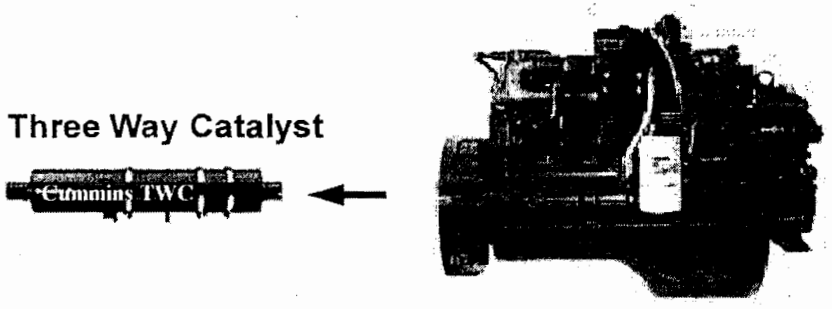
(diesel)



(Lean burn combustion with filter to capture particulate and SCR for NOx reduction)

ISL G

(natural gas)



(Stoichiometric combustion with Cooled EGR + 3-Way Catalyst)

Transit and School Bus Platforms

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Vocational/Specialty Trucks with CWI OEM Engine

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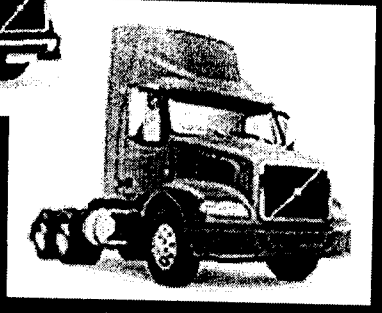
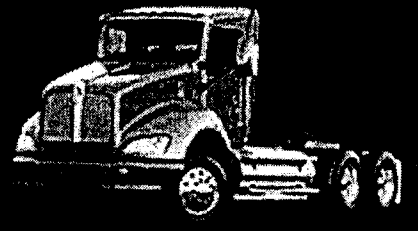
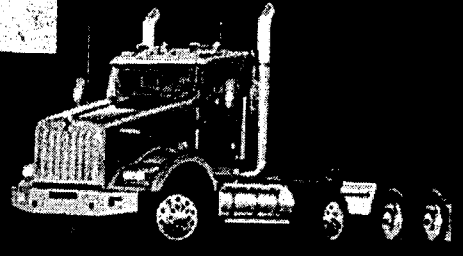
Local-Regional Haul/Line Haul with CWI OEM Engine







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Dual Fuel Technologies: Re-emerging Opportunity

- Dual fuel technology is making a comeback, primarily applied to "Intermediate Use (IUL)" and "Out of Useful Life (OUL)" HD engine applications either for legacy fleets or for use of older engine in new glider
  - Varying amounts of diesel is displaced by natural gas during duty cycle (0-70%; avg ~40-55% per drive cycle)

- 3/11 - EPA established "approval" process that reduced cost and data burden. "Approval" process still requires technical supporting documentation; field data. Beware of errant info on web sites about systems not needing EPA certification or approval.
- Presently, 500+ engine families have been approved and more are added each month
  - American Power Group, Clean Air Power, NGV Motori, Fyda, Landi Renzo, Diesel 2 Gas

Dollars and Sense

NGV Economics:
Components of CNG Cost,
Calculating Simple Payback
and
Life-Cycle Cost Savings

NGV AMERICA
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Components of (Fully-Loaded) CNG Cost

- Gas Bill:
  - Unregulated portion associated with purchasing gas
  - Regulated local gas utility distribution company (LDC) services
- Compression
  - Electric motor KWH and KW …OR engine driven unit's natural gas use
- Station Maintenance
  - Normal PM, scheduled replacement of parts, compressor rebuilds
- Capital /equipment amortization
  - Amortized cost of equipment or cost of capital factored into GGE price
- Federal, state and local excise fuel taxes (if applicable)
  - Tax is paid by the fuel seller; tax status of buyer determines
- Margin

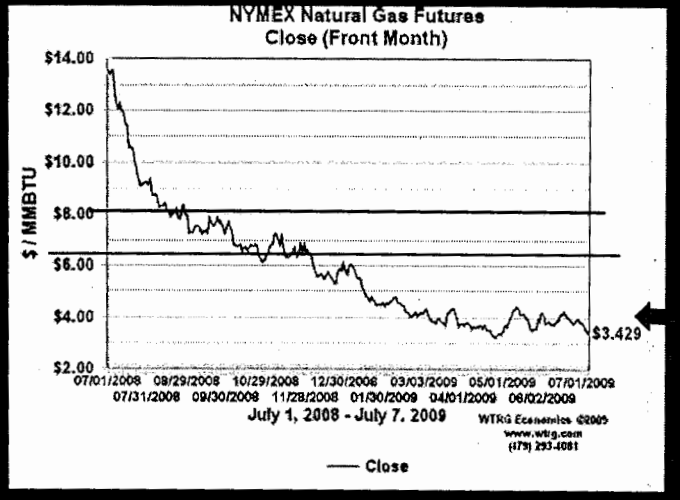
Components of CNG Cost

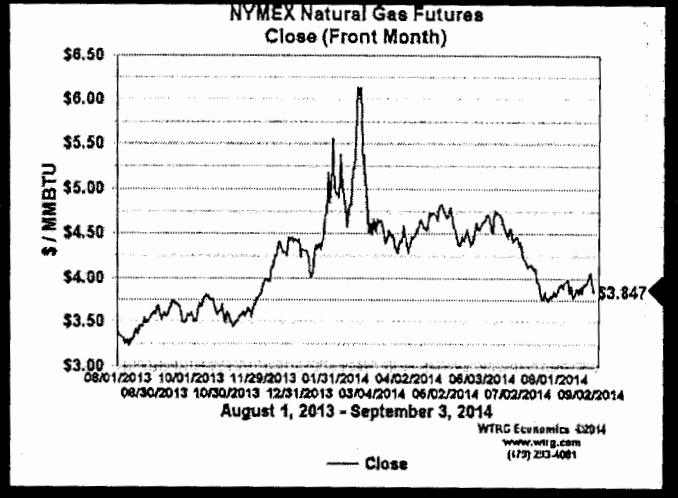
- Gas company bill (unregulated portion)
  - Commodity:

    Gas is drawn from wells, gathered/ pooled, stripped of impurities and "heavy" gases, then transported to "hubs" where it is available on the commodities market. Henry Hub (Louisiana) is used for NYMEX pricing.

    US DOE and industry long term price forecasts (prior to the economic collapse) pegged NYMEX natural gas at $6.50-8.00/MCF. Impact of shale gas is being reflected in more recent forecasts.

    Future market projections for gas are still up in the air now that shale gas has changed the equation





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Components of CNG Cost

Gas company bill (unregulated portion):

Gas Commodity:

- One cubic foot = ~1000 BTUs (Note: cf = volume, BTU = energy)
- One Mcf = 1000 cubic feet
- One Mcf = 1000cf x ~1000Btu/cf = ~1,000,000 Btus (MMBtu or dekatherm)

- Gasoline Gallon = 124,800Btu; Diesel Gallon = 138,700Btu… thus:
- **One MMBtu = roughly 8.0 GGE of (uncompressed) natural gas**
- **One MMBtu = roughly 7.2 DGE of (uncompressed) natural gas.**

- Your local gas company buys gas at various prices and uses weighted formula to pass along commodity at cost….commodity cost is PART OF the purchased gas adjustment (PGA).

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Components of CNG Cost

- Gas company bill (unregulated portion):
  - In addition to commodity costs, Purchased Gas Cost Adjustment (PGC/PGA) includes costs associated with getting gas to LDC's gate.
    - Gas acquisition
    - Pipeline capacity and transmission; "balancing" charges
    - Storage to supplement pipeline flows during heaviest demand periods
  - These costs vary across the country but may range from $.75-$2/MMBtu
    - Storage is often about half that fee
  - Commercial and industrial customers with steady gas loads often elect to buy their own gas through a broker/marketer and "transport" via the LDC, thus eliminating/reducing fees associated with storage.
    - Commercial/industrial customers with process loads (e.g., bakeries, bottlers, dairies, laundries, manufacturing plants)
    - Fleets (regardless of their facility load)

Components of CNG Cost

- Gas company bill (regulated portion):
  - Local utility distribution system charges a regulated tariff for delivery of gas from their city gate to your meter. This is a per-unit cost, not tied to the PGA. Rate typically includes:
    - Recovery of distribution system investment/depreciation
    - System operations and maintenance
    - Meter set / customer services
    - Administrative G&A
    - Other mandated fees / assessments
  - These tariffs are often stepped (i.e. larger volumes often earn lower rates)
  - Customers that do not meet minimum load requirements to qualify for 'transportation" rates buy "bundled" gas service from their LDC. Those with sufficient load can opt to buy their own gas and pay LDC to transport.
    - Minimum amount required to qualify for transportation rate varies widely from one utility area to the next… as little as 10,000 DGE/year to as much as 150,000 DGE/year

Components of CNG Cost

Sample case: commercial baking company with 20 step vans

- Gas Bill: $.85/GGE
  - Gas costs: ~$.59/GGE
    (based on estimated wellhead price of $4.00/MMBtu + $.75/MMBtu associated fees for transportation and services up to LDC city gate)
  - LDC's regulated city-gate-to-meter services: $.21/therm (~$0.26/GGE)
    (this rate may vary significantly from one utility to the next

As noted previously, most customers obtain their natural gas via a "bundled" rate that is adjusted/calculated – usually monthly or quarterly - using regulated tariff + PGA (utility's recovery of cost of the natural gas + services related to buying that gas and getting it to their city gate). Some customers may have option of buying their own gas, making arrangements to get it to utility's city gate and then paying their utility to "transport" the CUSTOMER's gas to the customer's meter via the utility's lines

Components of CNG Cost

- Gas Bill: $.85/GGE
- Electric compression costs
  - Gas delivered to the customer has to be compressed.
  - Most stations use electric motors although many larger stations use natural gas engine-drive compressors (depends on local regs).
  - Be sure to factor in both KWH consumption and KW demand
  - Estimated @ 1 fully-loaded KWh/GGE – a bit less for larger stations and more for small stations
  - Varies significantly from one utility area to the next
  - Nat'l range:$.04 -.30/KWH – : **~$.12/GGE**

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Components of CNG Cost

- Gas Bill: $.85/GGE
- Electric compression costs:$.12/GGE

- CNG stations require regular preventative maintenance/ service and occasional rebuilds of compressors and replacement of other parts.

- Cost per GGE will vary based on total throughput (generally, larger throughput = less cost/GGE due to economies of scale)

- Maintenance/Repair/Service: $.20-.50/GGE.: **$.30/GGE***

Components of CNG Cost

- Gas Bill: $.85/GGE
- Electric compression costs: $.12/GGE
- Maintenance/Repair/Service: Assume average of $.30/GGE
- **Capital amortization of equipment: $.25-.60/GGE**
  - Station cost divided by total GGE over life of equipment
  - Depreciation (5 yrs,7 yrs,10 yrs?), Cost of capital, Utilization factor

Example 1:

- 20 veh. x 15 GGE/day x 5 days/wk = 1500 GGE/wk =~80,000 GGE/yr
- 80,000 GGE/year x 10 yrs = 800,000 GGE
- If 100 scfm 10-post/20-hose time-fill station cost is $400K, then **$.50/GGE**

Example 2:

- Ex 2: 20 veh. x 20 GGE/day x 6 days/wk = 2400 GGE/wk = ~125,000 GGE/yr
- Same 100 scfm station, then **$.32/GGE**

Example 2 using 7 year depreciation:

- 125,000 GGE/year x 7 yrs = 875,000 GGEs = $.46/GGE

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Components of CNG Cost

- Gas Bill: $.85/GGE
- Electric compression costs: $.12/GGE
- Maintenance/Repair/Service: $.30/GGE
- Capital amortization of equipment: $.40/GGE

SUB-TOTAL:

- **$1.67 (use by or sales to tax exempt entities)**
- **$1.853 + state tax (use by or sales to taxable entities)**
  - Federal motor fuels excise tax: $0.183/GGE;
  - State motor fuels taxes vary significantly; in addition, some states tax natural gas the same as gasoline while others may tax at a lower rate than gasoline

Components of CNG Cost

- **What if NYMEX MMBtu cost rose to $8.00/MMBtu?**

- **Gas Bill: $1.35/GGE**
  - **Gas acquisition cost: $1.09/GGE ($8.00+.75 = $8.75/8)**
  - LDC transportation tariff remains: $.26/GGE
- Electric compression costs: $.12/GGE
- Maintenance/Repair/Service: $.30/GGE
- Capital amortization of equipment: $.40/GGE

- **Tax exempt fuel sales: $2.17/GGE**
- **Taxable fuel sales: $2.353 + state tax/GGE**

- **At $8.00/MMBtu, oil is very likely to be well over $200+/barrel… easily equates to $5+ for diesel!**

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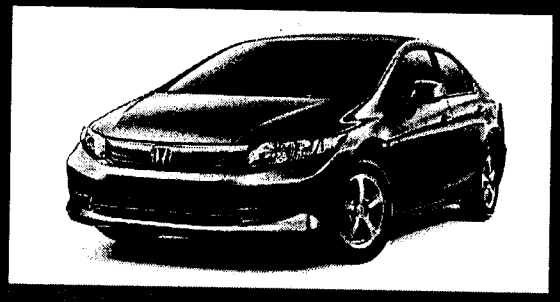
Medical Lab Courier Service



- Honda Civic Natural Gas sedan
- MPG: 31 (combined); 30K miles/year
- Fuel Use: 4GGE/day; 1000GGE/yr
- CNG Premium*: $6500
- Simple payback = 4.3yrs
  (based on $1.50/GGE savings)
- Life-Cycle Cost (LCC) Savings = $2550 (based on 6 year life)

- Grant: $3000; Remaining premium: $3500
- Simple Payback: 2.3yrs
- LCC savings: $5,550

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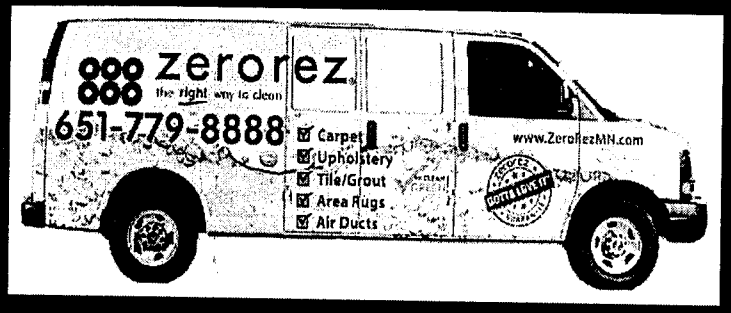

Cargo Van for Commercial Cleaning Services Business

- Chevy/GMC 3500 cargo van with PTO to run cleaning equipment; travel to/from location + 8-10 hrs/day @ 1200 rpm
- Fuel Use: 15GGE/day; 4000GGE/yr
- CNG Premium: ~$10,000
- Simple payback = 1.65 years
- LCC savings = $32,100 (based on 7yr life; $ 1.50/GGE savings)

- This business has 39 vehicles (x $6000+ fuel savings/vehicle) = $235-250K/year!

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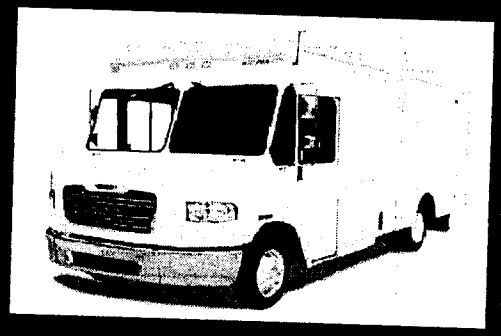
Step Van/Box Truck

- Sample Applications (e.g., textile rental service, bread/chips bakery; furniture/mattress delivery)
- MPG: 6.0, 95mpd x6 dys/wk, 30K/yr
- Fuel Use: 16GGE/day; 5000GGE/yr
- CNG Premium: $20,000
- Simple payback = 2.65 years;
  LCC savings = $55,125
  (based on 10 yr life and 1.50 savings/GGE)



- Grant: $12,500; Remaining premium: $7,500
- Simple Payback: 1 yr; LCC savings: $67,500!!!

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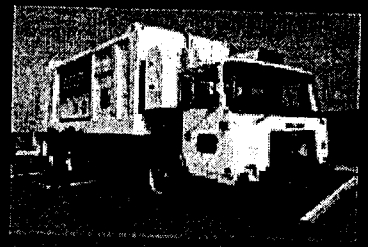
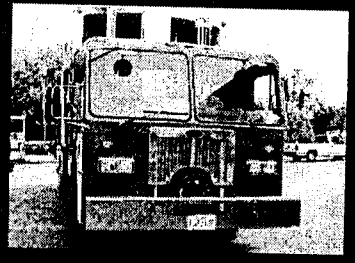
Refuse Truck
(LCF model)





- Crane Carrier LET, Autocar Xpeditor, Peterbilt LCF 320, Condor , Mack TerraPro
- MPG: 2.5 – 3.0 (lots of idle and PTO time)
- Fuel Use: 35-40gge/day; 10,500DGE/yr
- CNG/LNG Premium: $30,000
- Simple payback: 1.6years and LCC savings = $117K
  (based on $1.75 savings/DGE and 8 year life)

- Grant $15,000 ; Remaining Premium: $15K
- Simple Payback: 0.8 years;
- LCC savings: $132K!

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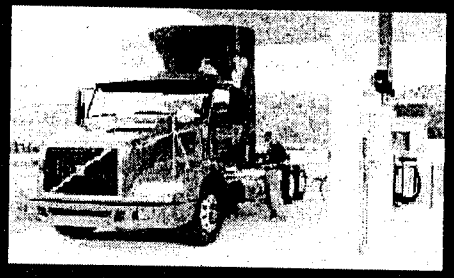
Grocery Truck



- Volvo VNM/VNL, Freightliner M2/Cascadia
- MPG: 5.6 miles/DGE; 100K miles /year
- 17,850 DGE/yr
- CNG Premium (w 84 DGE capacity): $60,000
- Simple payback: 1.9yrs ($31,235 yr savings)
- Life-cycle cost savings: $159K!
  (based on $1.75/DGE savings, 7-year /700K life before resale)

- Grant $25K; Remaining Premium: $35K
- Simple Payback: = 1.1 yrs
  (based on 1.75 savings /DGE)
- Life-cycle cost savings: $185K!

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Observations About the Consumer Market

- Economics-focused value proposition is weak at this time.
  - Consumer fuel use/ year: 375-450 GGE; based on $1.50/GGE savings and $6500 premium, payback is 9-11 years. Many retrofit options cost even more.
- While LDV prices are coming down with competition and economies of scale, expectations of 50% reductions in the near future may be overly optimistic.
  - Investments in R&D/certification/approvals are significant; far greater sales are needed to amortize these fixed costs
  - High-pressure CNG cylinders involve expensive advanced materials and manufacturing processes using sophisticated tooling technology. Volume pricing from suppliers of raw materials (carbon fiber, aluminum, etc.), which exceed 60% of cylinder cost, will require near exponential increases in orders, assuming the material is available vis-à-vis other industries clamoring for same limited supplies. Advances in manufacturing are increasing production rates and increased orders are providing better amortization of fixed costs, and competition is trimming margins but it may be unrealistic to expect drastic reductions without significantly larger volumes.

Observations About the Consumer Market

- If not economics, what is our value proposition?

- Significant sales potential (albeit small percentage of total LDV market) may be "early adopters" that often focus more on other "social" value propositions:
  - Environmental – "I'm doing my part to reduce pollution"
  - Energy Security/Patriotism - "I'm reducing reliance on foreign oil by using an American fuel and contributing to American jobs and American economy"
  - Technology – "I like using (and being seen using) advanced technology"
  - Socially forward thinking – "I believe in contributing my part to solutions to our collective challenges, even when the economics are marginal – money isn't everything" (I pay extra for "green power" on my electric bill, I support local businesses even when they cost more than the discount superstore, etc).

- Other value propositions
  - HOV access - maximizes productive time in high density/heavy traffic markets
  - Low-cost/no-cost parking fro AFVs

Observations About the Consumer Market

- Limited platform availability
  - Only 2 OEM LDVs are available at this time and a limited number of SVM options (most are SUVs, vans or pick-ups; OEM pick-ups are ¾ ton)
  - Sales/service channels are still nascent; warranty confusion abounds
  - Most consumer vehicles are used fleet vehicles and/or SVM aftermarket retrofits (including non-EPA-certified systems installed by upfitters who may/may not be aware of/following codes governing safe installation – a growing safety concern)

- Consumers have shown willingness to adopt NGV technology in areas where more ubiquitous public fueling is available
  - Most successful when offered i/c/w established retailers where other non-fueling benefits are available (food/beverage, bathrooms, familiar dispensing technologies and payment options, ease of access to travel routes, lighting, etc)

Observations About the Consumer Market

- Convenient home refueling, if priced right and reliable, will likely broaden the appeal and sales of consumer NGVs.
  - Current option (BRC FuelMaker "Phill") is expensive ($4.5-5K + installation for 0.45 GGE/hr) although others are in development
  - R&D into super low-cost systems is underway (ARPA-e). Target of $500 is still well off but interesting technology developments are being generated from R&D.
- Development of home refueling appliance ANSI standardis underway by CSA and industry stakeholders (NGV 5.1 – Residential Fueling Appliance)
  - Existence of Standard should spur mfr. investment and code official acceptance
  - Aggressive timetable – hope to publish by November 2014
  - Development similar to many other residential appliances
  - Key issues: high-pressure storage, fuel quality (water), gas flow reqs/allowances
  - Working to include reference to NGV 5.1 in other codes
- Regardless of unit price, cost will be add-on to vehicle premium so – again – probably something of particular interest to early adopters.

Fill'er Up

Natural Gas Fuel Station Types

Development, Ownership and Operations Options

Sizing/Design Considerations

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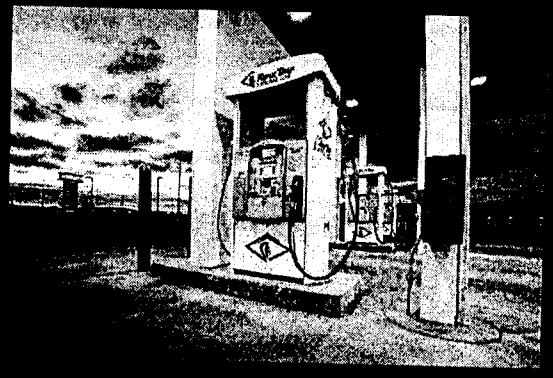
CNG Fuel Station Types

- **Time-fill capability**
  CNG is dispensed slowly directly to vehicles' onboard storage tanks. Lower cost station investment. Best for fleets that return to central lot and sit idle overnight or for extended periods and do not need fast fill capability.
  Home fueling devices are time-fill applications.

- **Fast-fill capability**
  Similar to liquid fueling station, same fill rates and times. A MUST for public access. Also good for larger fleets where fueling turn-around time is short.



- **Combo-fill capability**
  Comprises both time-fill and fast-fill. Often good for fleets that can fuel on time-fill but need occasional "top off" or want/need ability to provide public access

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Q: How Do We Solve The "Chicken & Egg" Conundrum?
(A: Make a chicken-egg omelet*)

- Throughput (sales volume) is key to generating economies of scale for the public access station owner, thus allowing pump price differentials that drive reasonable payback and life-cycle savings for customers

- Minimum load thresholds vary based on a variety of factors including: station type, station size, fuel price differential, ability to amortize maintenance costs, equipment depreciation, grants, ROI/IRR expectations

- Achieve minimum load thresholds by:
  - Identifying an anchor fleet that justifies the investment…or
  - Aggregate several semi-anchor fleets' loads if their depots or operating areas are geographically acceptable…or
  - Create retail public access for small fleets and consumers….or
  - All of the above

* Erik Neandross, CEO – Gladstein Neandross & Associates

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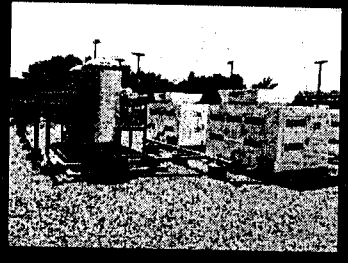
Station Options



- Station Location Options:
  - Offsite – use existing public access station if available, convenient and of sufficient capacity. Anchor fleets or 'pooled loads' create economies of scale.
  - Onsite - private access only or with public access "outside the fence"
- Different ownership & operations options available depending on throughput, funding:
  - Fleet owned & operated station
  - Outsource station O&O entirely via independent fuel provider and contract gas price
  - Fleet owned/leased station but contracted out operations for a fee (usually on a GGE basis)

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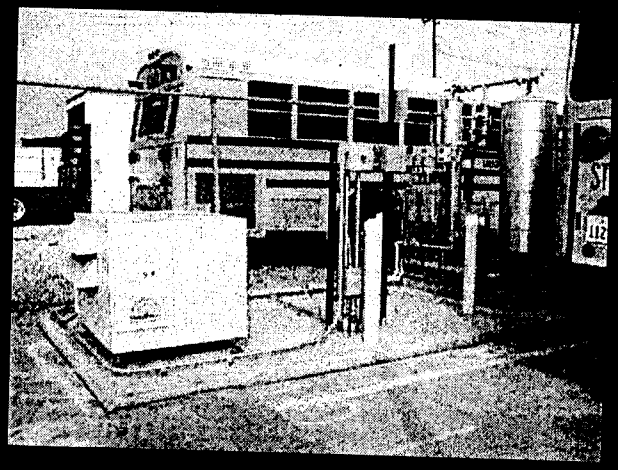
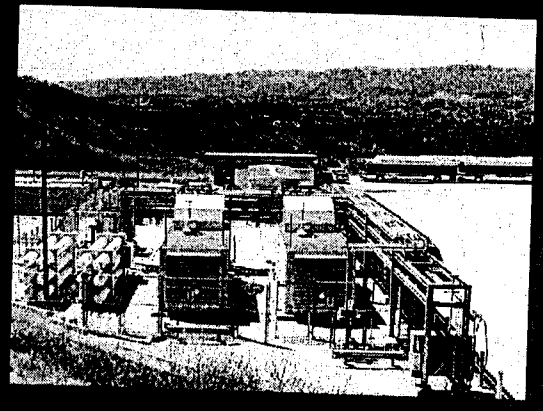
Natural Gas Station Development and Ownership-Operations Options: #1

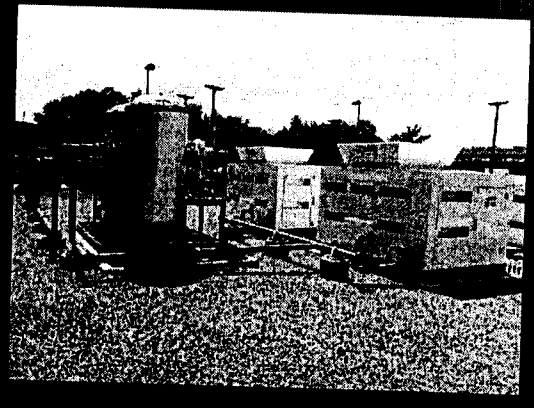
- Fleet owns & operates station
  - Fleet takes responsibility for building and then operating its own station. Fleet works with vendors or design consultant, manages build-out and takes responsibility for PM (parts, etc).
  - Applies to small-to-mid sized fleets that do not have offsite options nearby, b/c their fuel use does not meet the threshold required by most LDCs or independent developers to invest in developing, owning and operating station for them.
  - Some large fleets also opt for this but many do not have experience nor want responsibility for station operations and maintenance



Natural Gas Station Development and Ownership-Operations Options: #2

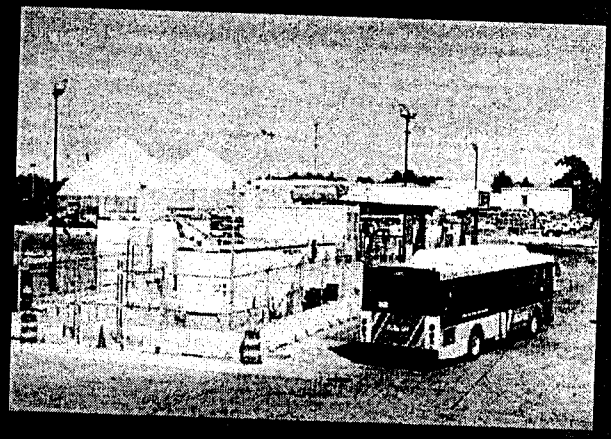
- Outsource station development, ownership, O&M to independent fuel provider
  - Fleet serves as anchor for independent operator's station, contracts long term fuel agreement with set price(s) and expected throughput for duration.
  - One stop shop. All capital investment and O&M risks are borne by independent fuel provider while fleet focuses on core competencies.
  - Fleet usually provides low-cost lease for property – important to making deal work - land is costly!
  - Often allows fuel provider option to create public access as well – sometimes a "royalty" paid back to fleet for retail sales from premises





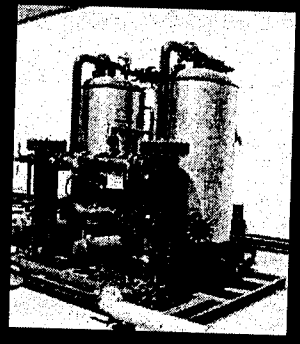
Natural Gas Station Development and Ownership-Operations Options: #3

- Fleet owns/leases station but contracts out operations for a fee (e.g., monthly fee or GGE basis)
  - Option used by many large fleets that need/desire ownership of their own station equipment but want to reduce risk, assure best O&M practices, etc
  - Contract is often (but not always) awarded to the firm that builds station; usually a 5-7yr contract.
  - Some fleets that initially Own & Operate their own stations decide that they want to delegate to others – put out RFP for O&M contract
  - Decision weighs pros/cons of "leaving $ on table" versus potential downtime risks, maintaining parts inventories, updated training of techs, etc



CNG Station Design Considerations

- How Much Fuel in How Much Time?
  - Vehicles/day, fuel/vehicle, fueling patterns
  - Maximum *daily* flow, maximum *hourly* flow, targeted fueling time per hose
  - Back-up fueling availability? Redundancy
- Real estate concerns
  - Proximity to major travel routes
  - Vehicle needs (entry/egress patterns)
  - Equipment footprint
  - Site development issues
- Equipment needs/performance/cost
  - Balance of compression and storage
  - Gas service (volumes/pressures, moisture)
  - Electric service (kVa, etc)
  - Dispensers and fuel management needs



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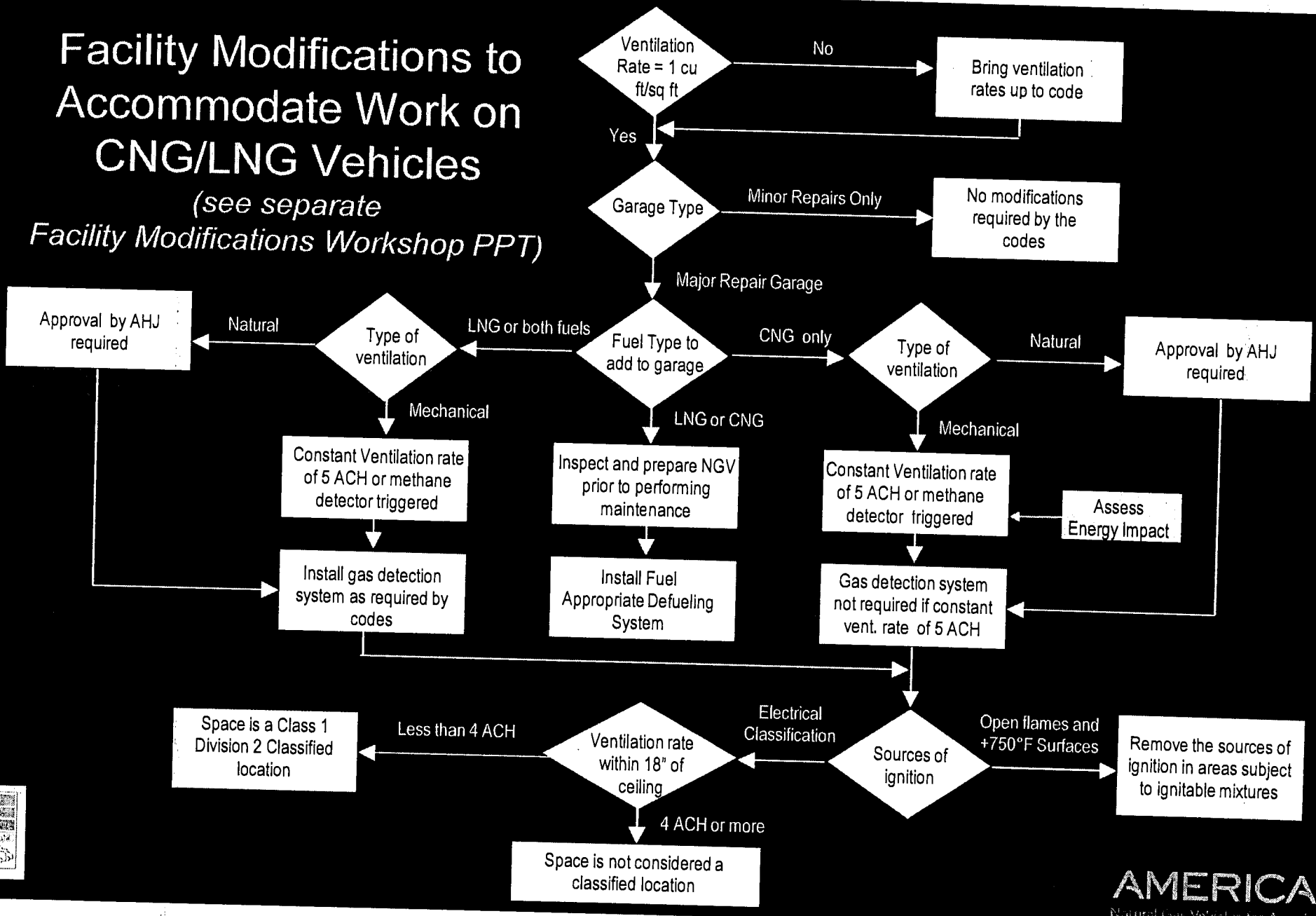
Facility Modifications to Accommodate Work on CNG/LNG Vehicles

(see separate Facility Modifications Workshop PPT)



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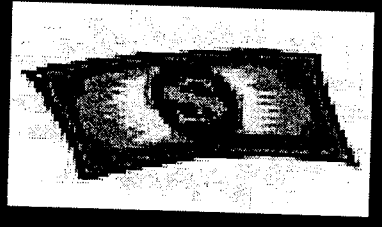
Implementation: How do we transition?

- Communicate benefits to your staff to get their "buy in" and to create feedback mechanisms that keep your program on track. Tell your customers; show environmental stewardship.

- Identify your internal champion, assemble stakeholders and resources; learn from others' successes, don't repeat mistakes… Use the resources of your Clean Cities Coalition

- Maximize use of OPM while it is available. Investigate other creative financing/leasing and station operation options. Learn how to purchase gas to lower fuel costs.



- Connect with your Clean Cities Coalition and fed/state agencies. Prepare fleet inventory replacement schedule and fuel use projections. Contact LDC, vehicle, fuel station development and/or equipment providers. Get started!

5 Tips That Make Some Grant Applications More Successful Than Others

(as suggested by experienced Clean Cities Coordinators)

- Speak to the interest/evaluation criteria of the funding agency (Ex: *EPA – Emissions/AQ; DOE – Petroleum Reduction, etc)*
- Clearly spell out the proposed benefits, the criteria by which you plan to measure those benefits, the action plan and the proposed processes in place to manage resources/take corrective action mid-stream to achieve the goal(s).
- Leverage funding/expertise of multiple stakeholders
- Communicate succinctly and effectively
- Meet all the administrative requirements ON TIME

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the attached document was served upon the parties in this action by electronic mail and by depositing a copy of the same in the United States Mail, First Class Postage Prepaid, addressed as follows:

Counsel for Tennessee Fuel & Convenience Store Assoc.	**Counsel for the Consumer Advocate and Protection Division of the Office of the Attorney General**
Melvin J. Malone Butler Snow Suite 1600 150 Third Avenue South Nashville, TN 37201	Wayne Irvin Assistant Attorney General Office of the Tennessee Attorney General Consumer Advocate and Protection Division P. O. Box 20207 Nashville, TN 37202-0207

This the 22th day of December, 2014.