Natural Gas as a Transportation Fuel

Models for Developing Fueling Infrastructure

September 2012

American Gas Foundation
400 North Capitol St., NW
Washington, DC 20001
www.gasfoundation.org

FINAL REPORT
NATURAL GAS AS A TRANSPORTATION FUEL -- MODELS FOR DEVELOPING FUELING INFRASTRUCTURE

Prepared for:

American Gas Foundation
400 North Capitol St., NW
Washington, DC 20001
www.gasfoundation.org

Prepared by:

Science Applications International Corporation (SAIC)
8301 Greensboro Drive
McLean, Virginia, 22102

September 18, 2012

DISCLAIMER

Legal Notice

Science Applications International Corporation (SAIC) prepared this report for the American Gas Foundation. Neither the American Gas Foundation, SAIC, nor any person acting on their behalf:

1. Makes any warranty or representation, express or implied with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately-owned rights, assumes any liability, with respect to the use of, damages resulting from the use of, any information, method, or process disclosed in this report, or

2. Recommends or endorses any of the conclusions, methods or processes analyzed herein. Use of this publication is voluntary and should be taken after an independent review of the applicable facts and circumstances.

Further, SAIC has not been requested to make an independent analysis, to verify the information provided to SAIC, or to render an independent judgment of the validity of the information provided by others. As such, SAIC cannot, and does not, guarantee the accuracy thereof to the extent that such information, data, or opinions were based on information provided by others. Any projected financial, operating, growth, performance, or strategy merely reflects the reasonable judgment of SAIC at the time of the preparation of such information and is based on a number of factors and circumstances beyond their control. Accordingly, SAIC makes no assurances that the projections or forecasts will be consistent with actual results or performance.

American Gas Foundation

Founded in 1989, the American Gas Foundation is a 501(c)(3) organization that focuses on being an independent source of information research and programs on energy and environmental issues that affect public policy, with a particular emphasis on NG. For more information, please visit www.gasfoundation.org or contact Jay Copan, executive director, at (202) 824-7020 or jcopan@gasfoundation.org.

Science Applications International Corporation (SAIC)

SAIC is a FORTUNE 500® scientific, engineering and technology applications company that uses its deep domain knowledge to solve problems of vital importance to the nation and the world, in national security, energy & environment, health and cybersecurity. The company's approximately 41,000 employees serve customers in the U.S. Department of Defense, the intelligence community, the U.S. Department of Homeland Security, other U.S. Government civil agencies and selected commercial markets. Headquartered in McLean, Va., SAIC had annual revenues of approximately $10.6 billion for its fiscal year ended January 31, 2012. For more information, visit saic.com. SAIC: From Science to Solutions®

Table of Contents

Executive Summary

Throughout the nation, there is presently a surge in interest in the development of new natural gas markets as a result of recent large increases in the projected volume of economically viable domestic natural gas due to advances in shale gas extraction technologies. While natural gas supplies nearly a quarter of the primary energy used to power our economy, less than one percent of transportation energy is supplied by natural gas. The mainstreaming of natural gas vehicles (NGVs) offers the potential to help diversify the primary energy used in our transportation sector and to provide attractive new markets for natural gas. As such, many natural gas local distribution companies (LDCs) are currently assessing their approach to NGVs.

In speaking with LDCs that are interested in NGVs but presently have minimal or no NGV programs, the authors observed many were uncertain where to focus their efforts. This report strives to assist the federal and state regulatory agencies, LDCs and the general public in evaluating approaches to NGVs within regulated service territories. Models and associated strategies that can lead to the establishment of natural gas as a mainstream and sustainable transportation fuel are discussed. Examination of viable NGV business models may assist both in the establishment of new NGV programs, and in the further development of existing NGV programs.

Current models implemented by LDCs are divided into three primary categories:

- **Rate-based Models** – These are used by LDCs with NGV activities that are allowed in their rate-base. Under the rate-based model, investment is made by the LDC's investors and is reimbursed through rates charged to the customers, which include a fixed rate of return (ROR) or profit, as set by the regulatory commission. Where, when, and what NGV projects are invested in may be limited by the regulators, and may not be based solely on financial criteria.

- **Non-Rate-based Model** – This model is used by LDCs to conduct activities that directly or indirectly support NGV development, the cost of which is not allowed to be passed on to the LDC's customers. In some cases, the LDC may be able to collect their commission-fixed ROR from these projects when they yield a profit. Typically, LDC investments under this model are relatively modest.

- **Commercial Model** – This model is used by unregulated affiliates of LDCs such as commercial companies under the same parent or holding company, although it is also applicable to unaffiliated commercial companies. Determination to pursue a particular NGV project is based on common commercial investment criteria including return on investment (ROI), ROR, and payback period, which are adjusted based on project risk. While shareholder risks may be greatest under this model, potential profits are not limited.

Hybrids of the above models may also be applied in which two or three of the model types are mixed to provide different services or to be used in different markets. The models applied in a hybrid approach may also shift with time as NGVs gain a greater share of the vehicle market.

Regardless of the model type, all investments carry a risk of loss. While many risks can be listed for any project, three fundamental risks that will likely make or break the ultimate success in developing natural gas as a sustained, mainstream transportation fuel are:

- Endurance of the price spread between natural gas and the competing fuels
- Technological competitiveness of NGVs both compared to conventional and other alternative transportation technologies
- Scale of NGV adoption, whether nationwide or in a defined region or market

A basic understanding of these and other NGV investment risks is a prerequisite to determine how to allocate risk exposure. Allocation of risk to ratepayers through rate-basing NGV projects is supported by the significant public benefits associated with NGV use. These benefits include reduced life cycle emissions compared to conventional transportation fuels, increased national-level energy independence, reduction in the national trade deficit, and increased economic stability associated with reduced exposure to the international price swings of petroleum-based fuels. How these public benefits are valued varies among the states, hence regulatory commission acceptance of rate-basing NGV investments also varies.

In general, states with policies to promote reduction in greenhouse gases and other emissions may be more likely to welcome rate-basing NGV investments as a means of supporting their emissions policies. Since emissions reduction is supported by energy efficiency, states with emissions reduction policies tend to have delinked (i.e., decoupled) natural gas sales and revenue for their regulated LDCs. In these states, obtaining a ruling to exclude NGV fuel from decoupling mechanisms may be needed to harmonize regulatory commission rules with state policy. This may also maximize benefits from NGV expansion.

While the basic NGV business model type affects who may bear the risk of NGV investments, the design of specific strategies within a model determines who the ultimate risk-holders are. Table 1 displays primary and secondary risk holders for strategies within each of the three primary model types.

There is a tendency to design strategies such that risk is shifted to other parties as much as possible, regardless of whether the strategy is designed by an LDC or a commercial company. However, for sustained NGV use, the risk-bearers should be able to mitigate their risks. If NGV operations, including both refueling stations and NGV users, are not economically viable, they are unlikely to provide sustained natural gas demand. As a result, the customer's NGV risks affect the LDC regardless of the level of LDC involvement. Educating customers about their options in risk mitigation measures increases the chances of sustained NGV adoption and associated natural gas load.

Table 1 NGV Strategies and Risk Holders

Strategy	Risk Holder	
	Primary	Secondary
Rate-based Model *(for regulated LDCs)*		
LDC-owned public refueling stations, no fuel contract	Ratepayer	LDC shareholder
LDC-owned refueling stations (public or private) with anchor customer, take-or-pay contracts	User	Ratepayer
LDC compression services tariff for recouping costs from users	User	Ratepayer
Low interest loans for vehicle purchases, refueling infrastructure, home refueling devices, etc.	User	Ratepayer
Incentives for vehicle purchases, refueling infrastructure, etc.	Ratepayer	LDC Shareholder
Expansion or construction of LDC owned liquefaction facilities for LNG wholesale	Ratepayer	LDC Shareholder
Non-Rate-based Model *(for regulated LDCs)*		
Pilot program funded by shareholders, able to receive LDC's ROR	User	LDC Shareholder
Grant from State or other entity for compression services at new stations with approved fee to recoup costs from users	User	none
Commercial Model *(for unregulated companies/ affiliates)*		
Company-owned public refueling stations, no fuel contract	Shareholder	User
Company-owned refueling stations (public or private) with anchor customer, take-or-pay contracts	User	Shareholder
Lease NGVs	User or shareholder -- Depends on contract terms	
Transportation of LNG or CNG to refueling stations	User or shareholder -- Depends on contract terms	

Finally, the ultimate goal of establishing natural gas as a sustained, mainstream transportation fuel may be furthered by consideration of the changing role of the LDC with expansion of NGV markets. Rate-based NGV programs may do much to jump-start NGV adoption. Indeed, they may be an essential component to achieve a sufficient momentum for natural gas to become a mainstream transportation fuel. This may be done without a later sag in NGV use when rate-based programs end if strategies are designed with recognition that the economic benefit of NGV use will need to continue beyond the duration of rate-based programs. This suggests the essential role of commercial operations for building

and operating the NGV fueling infrastructure when rate-based programs are no longer needed. Under circumstances where commercial operations already provide for a significant NGV market, LDC programs can advance NGV market penetration through strategies such as focusing involvement in marginal markets that are not targeted by commercial efforts; establishing incentives for NGV adoption and/or commercial refueling station development; and supporting NGV adoption through educational outreach to targeted markets.

1 Introduction

Natural gas (NG) has been a recognized transportation fuel since the early twentieth century, but the expansion in plentiful, cheap crude oil after World War II gave liquid fossil fuels a dominating transportation market share throughout the remainder of the century. In the early 21st Century, we are poised for a shift to a more diversified transportation fuel market. Advances in natural gas extraction technologies are enabling the delivery of abundant, affordable natural gas and the prospect of a shift to greater use of natural gas as a transportation fuel.

While the price of natural gas per unit energy has historically been lower than liquid fossil fuels, this price differential must be large enough to overcome barriers to substantial market penetration by natural gas vehicles (NGV). These barriers include the capital expenses associated with infrastructure development for storage of natural gas in compressed or liquefied form, and the cost premium for lower-production vehicles with more expensive fuel tanks. Additional barriers have included the lagging optimization and availability of NGV. Although these later two obstacles have been reduced in recent years, lingering negative perceptions persist as a result of early-adopters' experience with less-developed, earlier engine and vehicle technologies.

LDCs represent a key group of stakeholders in the natural gas industry that have historically been promoters of NGVs. Many LDCs are currently assessing their approach to this market. In speaking with LDCs that are interested in NGVs but presently have minimal or no NGV programs, the authors observed many were uncertain where to focus their efforts. The objective of this project is to explore models that can lead to the establishment of natural gas as a mainstream and sustainable transportation fuel with consideration of past practices, innovative approaches, and the current and near-term environment. Recognizing the important role LDCs will play in establishing natural gas as a mainstream transportation fuel; this report focuses on models from the perspective of local distribution companies (LDCs). Rate-based LDC projects are emphasized, with additional attention given to supporting strategies for non-rate-based LDCs activities, and for unregulated affiliates of LDCs.

LDCs are defined as companies with monopoly ownership of local gas distribution lines, and as such, are regulated by State utility commissions. As regulated entities, LDCs operate in a unique business environment. All expenditures are reviewed by a State regulatory commission which sets rules on the types and magnitude of expenses for which the LDC can be reimbursed from their rate-base (i.e., customer charges). Expenditures that are deemed "unallowable" are paid for from the LDC's profits. The rate of return (ROR), or profit margin that an LDC can achieve is also set by the regulatory commission. The rules and limits set by regulatory commissions vary among states, and also among LDCs within the same state.

LDCs may or may not have separate but affiliated unregulated companies that provide other functions in the gas industry, such as gas marketing or commercial refueling station construction. Both the

commission-set rules under which an LDC operates and the types of unregulated commercial companies affiliated with an LDC are key considerations in determining their optimal model for NGV activities.

In today's environment LDCs often do not own the gas flowing through their pipelines, and their revenue is determined by either the volume of gas they distribute, or if they are decoupled, by a volume-neutral means established by their regulator. Particularly for LDCs with a distribution system that reaches the full extent of their regulated service territory, developing a mainstream, sustainable NGV market represents a promising means for increasing their system load and related improvements in efficiency.

The vehicle markets initially targeted for NGV adoption are those likely to achieve payback on their vehicle and infrastructure investment within a few years, regardless of the presence of incentives (e.g., tax credits, rebates, etc.). Centrally refueled vehicles with high mileage can receive the economic benefits of natural gas absent the presence of a larger NGV refueling infrastructure. High mileage, centrally-refueled fleets are commonly associated with large distribution warehouses (e.g., Walmart) and delivery services (e.g., FedEx and UPS). While these fleets are comprised primarily of heavy-duty and medium-duty vehicles, there may also be centrally-refueled light-duty markets with high enough fuel use per vehicle to yield a reasonable payback period without incentives (e.g., taxicabs).

In some markets with high levels of fuel consumption, central refueling may not be necessary for favorable NGV economics. An example of this is the long-haul trucking market for which private investors are developing a natural gas refueling infrastructure at truck stops along major corridors and attracting a growing customer base.[1,2] As NGVs become mainstream in the initially targeted markets, the costs of NGV adoption are expected to decrease allowing more favorable economics for additional sectors to enter the NGV market, ultimately including personal passenger cars and home refueling. The rate of NGV adoption, however, may be increased with programs designed to reduce the initial barriers to market entry: vehicle premium costs, refueling station availability, and consumer confidence in NGVs. Market acceleration is necessary in instances when supply infrastructure and fueling demand need to be simultaneously developed to mitigate the risk to ratepayers or shareholders of unused assets

1.1 Project Approach

The project was conducted as a series of tasks that first included assessments of the status of the NGV market and recent and current regulations and incentives based on publically available data. Summary findings are presented in Appendix A, largely on a state-by-state basis to assist in comparing different trends and circumstances for the state(s) in which their territory resides.

1 Margaret Ryan, "Trucks can keep on trucking, LA to Salt Lake", February 7, 2012, AolEnergy. As viewed at: http://energy.aol.com/2012/02/07/lng-trucks-can-keep-on-trucking-la-to-salt-lake/

2 "Supply Chain Fleet Operators Increasingly Turn to Natural Gas Power", March 26, 2012, Seeking Alpha. As viewed at: http://seekingalpha.com/news-article/2285271-supply-chain-fleet-operators-increasingly-turn-to-natural-gas-power

While public literature was reviewed for identification of relevant models, the primary sources for identification and assessment of LDC models for NGVs was a series of telephone interviews with key players in this field. As such, the content of this report is very substantially based on the collective experiences of the interviewees, whose affiliations are listed in Appendix B.

1.2 Report Structure

This report is structured to facilitate the customized development of model(s) for a particular LDC and regulated service territory. This structure has been chosen based on the recognition that circumstances vary substantially among LDCs, hence the most appropriate business models also vary. The target audience includes regulators, public policy makers, LDCs and the general public who are evaluating their role in NGV market development, particularly those that have little to no current involvement with NGVs. This report is designed to help guide the development of an NGV model, beginning with identifying their best role under their circumstances.

Common components of models are briefly reviewed in Section 1.3. Section 2 reviews the underlying drivers of all models benefits and risks, with consideration of distinctions between models for LDCs and their unregulated affiliates, and addresses several overarching risks for NGV market expansion. While natural gas pricing relative to conventional fuels is arguably the primary risk, technological competitiveness compared to both conventional fuels and other alternative technologies also has the potential to substantially hinder NGV market growth. The third and final overarching risk discussed in Section 2 is the risk of the development of geographic or market segment islands of NGV use rather than nationwide mainstreaming across market sectors. Both LDCs and their transportation customers will need to be comfortable with the overarching risks discussed in Section 2.

To aid in development of a business model that is customized with the most suitable strategies, readers are first introduced to the basic types of business models an LDC and its affiliates may employ: rate-based, non-rate-based, and commercial. These models are distinguished by who the investors are and who bears the financial risk – multiple model types may be combined to create a hybrid model. Questions are posed and discussed to guide the reader in their selection of an appropriate model (Section 4) and analysis of the best strategies for their circumstances (Section 4). Market research and resulting responses to the questions will help identify the most suitable role in facilitating the sustained development of natural gas as a mainstream transportation fuel.

Finally, Appendix A provides summary graphics and tables of the current status of NGV markets in the US on a state-by-state basis to assist in the assessment of the NGV market in a particular regulated service territory.

1.3 Common Components of Models

The basic process of model development is largely the same for both LDCs and their unregulated commercial affiliates. All models begin with defining goals and objectives. For NGV models, this should answer questions such as: Is the organization interested in making a higher absolute return or a higher rate of return? Does it want to have the greater certainty of a return at the regulatory commission's approved rate or does it want to take higher risks to potentially realize higher profits? Setting the public policy, regulatory, and organizational goals will help define the model structure and mode of operation.

After defining goals, in-house capabilities are assessed to identify what can be accomplished most efficiently in-house and what can be accomplished most efficiently out-of-house. A strategy is then developed to build on the competitive advantages of both the organization and any networked affiliates. This process includes some tasks that are common elements of almost all NGV business models, whether they are implemented by an LDC or an unregulated LDC-affiliate. The general process is described in the following section, followed by a discussion of means for measuring and assuring model success.

The General Process

Common components in the process of model development include the following tasks:

1. ***Collection of Regional Information*** – types of commonly collected regional information include:
    - Regional NGV Data – profiles of current NGV fleets in the region including number of vehicles, vehicle types, how they refuel, and whether NGVs and associated fuel use has increased or decreased in recent years. Where applicable, both the number of public NGV refueling stations and delivered fuel volumes should be examined to understand recent trends.
    - Regional Fleet Data – data on regional fleet sizes, vehicle types, and mileage are available for purchase from commercial, for-purchase databases such as FleetSeek.
    - Corridor Development Efforts – regional private efforts to develop natural gas refueling corridors both within the LDC territory and in areas near their territory should be identified and their plans understood.
    - Adjacent LDC Efforts – LDCs with adjacent territory may be contacted to identify potential coordinated programs to create larger contiguous regions with NGV refueling.
2. ***Market Segmentation Analysis*** – the vehicle market is segmented based on typical mileage; vehicle type (e.g., light, medium, or heavy duty); fuel economy; and refueling station type (i.e., public refueling or private central refueling). Feasibility analyses with and without the presence of any current incentives are typically conducted for each segment with increasing levels of detail and variations for segments that consume sufficient or near-sufficient fuel to achieve a reasonable payback period (i.e., less than 3 years). Fuel prices used in the feasibility analyses should reflect a range of reasonable prices.
3. ***Market Competition Assessment*** – the regional presence of and trends in commercial NGV services are important indicators of competition. Where commercial NGV services are growing, an LDC can craft their NGV program to encourage the growing industry, recognizing that

support from commercial companies will be essential for sustained NGV adoption. LDC programs designed to jump-start NGV adoption may choose to focus on areas beyond current commercial NGV investment, whether distinguished geographically, by market segments, or by different services. Alternatively, LDCs may encourage commercial projects through incentives such as zero-interest loans, lease-to-own arrangements, rebates, grants, etc.

4. ***LDC Goals and Customer Identification*** – information collected in the above steps is used to define goals for the LDC in NGV market development. Based on these goals, target customer profiles are developed. For many NGV programs, aggressive marketing based on customer profiling is essential for success.

5. ***Customer Preparation*** – viability of a customer's NGV operations, whether they are refueling station operators or NGV users affects the LDC. If these operations are not economically viable to the customer, they are unlikely to provide sustained natural gas demand. As a result, the customer's NGV risks affect the LDC regardless of the level of LDC involvement. These risks can be mitigated by preparing the customer to better handle their risks. Table 2 lists some of the risks NGV customers face.

Table 2 Risk Considerations for Customers

Business Risks	Market Risks	Operational/ Technology Risks
• Fuel supplier dependability • Infrastructure stability • Change in incentives • Negative media reports of a fuel-related incident • Bad business conditions • Structural risk (will a sustainable CNG market develop?)	• NGV price rise • Diesel price drop • Increase in vehicle price differential • Lower salvage value • Poor economic conditions • Competition from other modes of transport	• Reduced vehicle performance • Increased maintenance costs • Reduced vehicle life • Spare parts unavailability • Poor service responsiveness • New, better technologies • Picking the right engine – brand, configuration, etc.

Measuring and Assuring Success

The definition of success for a model or strategy should be developed along with the business plan and regulatory or public policy goals. This definition should include measureable, realistic targets with specified dates for achievement. Further, data collection to allow tracking of program success should be included in the program plan. Targets for success may be in terms of a return on investment, volume of natural gas use by vehicles, number of NGVs, etc.

Unfortunately, metrics of program success have not been tracked by the LDCs with more established NGV programs that were interviewed for this report. In cases where NGV programs are implemented because they are viewed as beneficial for the general public (such as many state-level alternative fuel and clean fuel incentives) an overriding belief in longer-term program benefits may reduce interest in

data collection for current statistics. This lack of statistics limits assessments of the success of different recent programmatic approaches.

However, if successful programs are defined by consistent increases in natural gas sales for vehicle use, a common component of success appears to be supportive efforts between the state and the LDC. In states with incentive programs for clean or alternative transportation fuels, the selection of NGV over other alternatives may be substantially increased by targeted LDC programs that at a minimum provide information on NGVs and technical assistance for feasibility studies. Recognizing the lack of familiarity most customers have with NGV infrastructure needs, customer selection of other transportation fuel options may be expected in the absence of active LDC programs.

Public Data for Program Assessments

The US Energy Information Administration (EIA) collects a variety of data that could be reasonably used to suggest the success of combined state- and LDC-level NGV programs. However, care should be taken in developing conclusions from these datasets because they sometimes exhibit opposite trends within the same time period. Some of the contradictions and limitations of the different EIA datasets are presented below to facilitate appropriately qualified conclusions.

There are two relevant sources of data within the US DOE that may assist in assessments of NGV use: The EIA Annual Survey of Alternative Fueled Vehicles (Form EIA 886) and The EIA Annual Report of Natural and Supplemental Gas Supply and Disposition (Form EIA-176).

The first of these, the Alternative Fueled Vehicles (AFV) survey, is completed by AFV original equipment manufacturers (OEMs), AFV converters, and operators of federal, state, and utility fleets in addition to some large municipal and private fleets. The survey form (Form 886) requests information on:

- Number and type of AFVs that vehicle suppliers (OEMs and after-market converters) make available
- Number, type, and location of AFVs in the surveyed fleets
- Number of miles traveled by the surveyed AFVs – while the instructions do not address estimated mileage, all fleets do not collect mileage data, hence at least some estimates are likely
- AFV fleet fuel consumption, which as specified in the instructions, may be estimated based on miles traveled and assumed miles per gallon
- Number of retired AFVs

The published AFV Survey report includes data that is estimated for surveyed fleets in addition to fleets and privately owned vehicles that are not part of the survey. Data are grouped by state and vehicle type – data are not available on a respondent level. The fuel consumption estimates are often based on vehicle mileage, EPA estimated fuel economy, and an adjustment factor for on-road use, with additional assumptions on fuel use in bi-fuel vehicles. The modeling methods employed do not account for vehicle

resale across state lines, which may increase in significance depending on the types of incentives for NGV adoption that are available.

The EIA Annual Report of Natural and Supplemental Gas Supply and Disposition (Form EIA-176) is required to be completed by natural gas distribution companies.[3] This survey includes separate reporting of natural gas deliveries to residential, commercial, industrial, electric power, and vehicle fuel use, but does not include separate reporting of natural gas used by the distributor for vehicle use. In addition to typical LDCs, the survey includes distributors that only provide natural gas for vehicle fuels (e.g., Clean Energy, Natural Fuels, Transtar Energy, Blue Fuels, etc.). Data are available on a state-by-state level for each survey respondent. While EIA describes quality control of the data,[4] some year-to-year variations for a single respondent are three orders of magnitude. For example, vehicle fuel deliveries for Oklahoma Natural Gas are shown as 2,118 MMcf in 2006 and 2.8 MMcf in 2007. In a query to Oklahoma Natural Gas, they had no recollection of such a large change in vehicle fuel deliveries, suggesting possible differences in reported units.

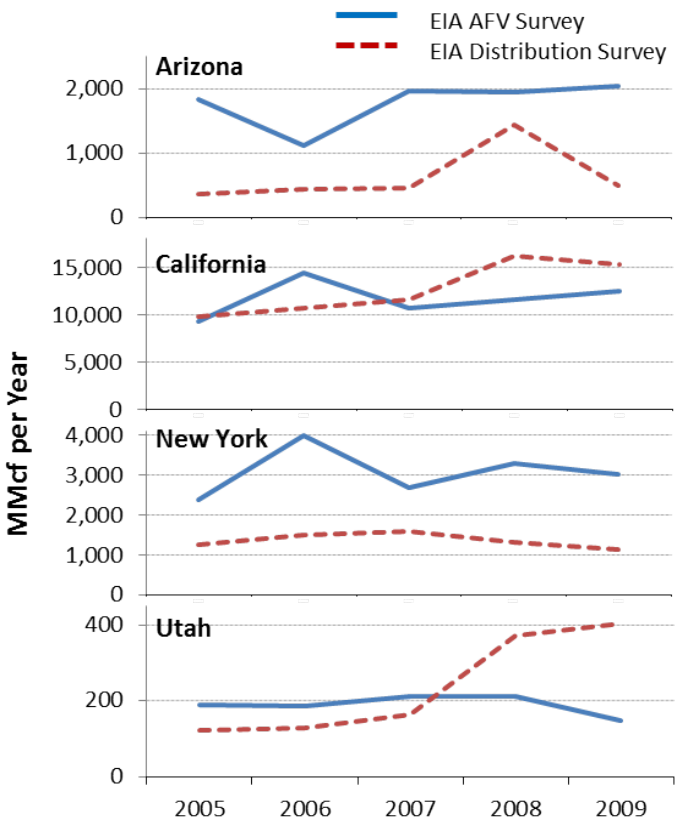
Recognizing the assumptions applied to the EIA's AFV survey data and quality control concerns of the natural gas deliveries survey, some comparisons of state-level estimated NGV fuel use from these two databases are shown in Figure 1.1. These different datasets suggest varied trends in NGV fuel use. For example, distribution companies in Utah report increasing deliveries of natural gas for NGVs between 2007 and 2009, while EIA AFV survey estimates suggest decreasing use of natural gas by Utah's NGVs over the same time period.

Further assessment of issues and reconciliation of varied trends in these datasets was beyond the scope of this project.

3 Annual Report to Natural and Supplemental Gas Supply and Disposition, Form EIA-176 Instructions. As viewed at: http://www.eia.gov/survey/form/eia_176/instructions.pdf

4 EIA, Natural Gas Data Sources. As viewed at: http://www.eia.gov/dnav/ng/TblDefs/NG_DataSources.html

Figure 1.1 Comparison of EIA Datasets for Natural Gas Use in Vehicles. *



** EIA AFV Survey estimates of fuel use, published in units of gasoline gallon equivalents, were converted to MMcf based on assumptions of 1,027 Btu/cf and 5.119 MMBtu/barrel of gasoline.*

Sources: EIA Annual Alternative Fuel Vehicle Survey and EIA Report of Natural and Supplemental Gas Supply and Disposition

2 Benefits and Risks: Underlying Concepts for Model Selection

Models are developed to achieve specific goals with associated benefits. In general terms, the business decision to undertake an investment to achieve these goals is based on a weighing of the project benefits against the risks of investment loss, and comparing the risks and benefits to other investment options. A brief overview of the potential benefits of NGV projects is presented below. This is followed by a discussion of the different approaches to investment risk in LDCs and commercial companies – keeping these differences in mind will help with long-term, coordinated development of NGV markets. The remaining three sections of this chapter discuss three underlying risks to the development of natural gas as a sustainable, mainstream transportation fuel: fuel price, technological competitiveness, and islanding.

2.1 Benefits from NGV Projects

The primary benefit of NGV projects to commercial companies are the profits that can be made from this growing market. As such, commercial companies target economically viable projects that minimize risk and maximize the return. Like other public companies, the LDC has a primary interest in maximizing returns to their investors. This has been traditionally achieved by either successfully petitioning the regulatory commission for a rate increase, or by increasing the volume of natural gas delivered, which in turn increases revenue and associated profits. In states where LDC revenue is delinked from sales volume (e.g., decoupled), revenue may be tied to the number and type of customers, specific costs, or some other approach that allows fair compensation for the LDC without discouraging efficiency improvements. LDCs with delinked revenue and sales volume may seek rulings to exclude vehicle fuel deliveries from the decoupling mechanism, as is common for industrial gas deliveries. In most cases, successful NGV programs will increase LDC returns due to efficiency gains, if not also due to sales volume increases.

In addition to volume-associated revenue increases, other benefits the LDC can derive from succeeding in the NGV business may include:

- Increased pipeline system efficiency depending on demand profile and pipeline capacity through provision of a year-round load
- Potential load leveling in markets where transportation fuel volumes are greater in the summer.
- Reductions in lifecycle emissions with use of NGV compared to conventional fuels. Depending on the regional power generation sources, lifecycle emissions may also be lower than for electric vehicles. Emissions benefits may allow NGV users to obtain and sell emission credits.

- Contribute to the national effort for energy security, increased employment, and balance of payments as a result of switches to a domestic fuel.

- Establishment of a new technical area that can stimulate and reward staff.

All but the last of these benefits affect all customer classes or provide broad social benefits, both of which have been considered justification for rate-basing NGV-related investments. Other considerations for rate-basing NGV refueling include prevention of possible price gouging (i.e., charging more than is reasonable for natural gas when there is a large price difference between natural gas and conventional liquid fuels). Price gouging is a particular concern when there is only one commercial operator in an area. Rate-based NGV refueling may also enable similar prices at refueling stations across a region, which can facilitate customer confidence in adopting NGVs.

2.2 Commercial versus LDC Approaches to Risk

The risks of an investment are typically handled differently in commercial projects and LDC projects.[5] For commercial projects, investors want a return of their investment, plus a risk-free rate of return, plus a risk premium. The greater the risk, the greater the expected risk premium demanded by the investor. Poorly understood risks typically have the highest risk premiums. While the risks associated with NGVs are being better defined and reduced, the risk premium is still greater than for conventional fueled vehicles. These risk adjusted costs (e.g., cost of capital, higher return) are ultimately passed on to the NGV user in the form of higher pump prices.

For LDC projects, investment risk is handled differently because regulatory commissions typically do not allow risk-premium adjustment to the ROR. As such, LDCs do not include the risk-adjusted costs of capital and can offer lower prices at the pump. This improves their market position by attracting a larger clientele and higher consumption, which effectively lowers their risk of failure. If an LDC venture fails, the risk is borne by ratepayers when the regulatory commission allows the loss to be rate-based, or by the LDC investors when the loss is not deemed allowable by the commission.

While the accounting for risk may be handled differently by commercial companies and LDCs, the fundamental risks themselves are largely the same. These risks include changes in availability of incentives for NGV adoption, changes in taxes, and changes in LDC allowable costs– all of which can be minimized by planning projects that do not depend on long-term continuation of the current regulatory environment to be successful. Other risks include negative media attention due to a fuel-related incident. While the safety record for NGV's is good, as a fuel that the public is less familiar with, any fuel-related incident is likely to raise safety concerns and erode public confidence in NGVs.

Other risks shared by both LDCs and commercial refueling station investors are station underutilization and financial stability of the anchor fleet(s), both of which may be mitigated with proper research and analysis prior to investment, and equipment removal and re-deployment under worst case scenarios.

5 Investment risk is the probability of a loss multiplied by the expected consequences.

While many risks can be listed for any project, three fundamental risks that will likely make or break the ultimate success in developing natural gas as a sustained, mainstream transportation fuel are:

- Endurance of the price spread between natural gas and the competing fuels (i.e., the fuel pricing paradigm);
- Technological competitiveness of NGVs both compared to conventional and other alternative transportation technologies;
- Scale of NGV adoption, whether nationwide, or in a defined region or market (an island).

Each of these fundamental risks is further discussed in the sections below.

2.3 The Fuel Price Paradigm

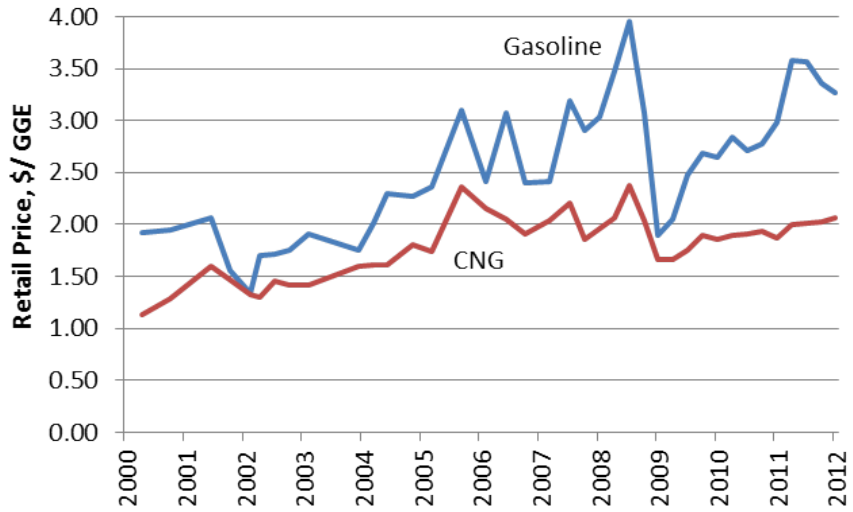
The fuel price paradigm poses a key risk for NGV projects. Throughout the 1990's, retail natural gas prices were below those of conventional transportation fuels on an energy basis, and there were many programs across the nation to promote NGV adoption. Despite this, NGV market establishment met with only limited, niche-market success. From a business economics viewpoint, the price differentials of the 1990s were not sufficient to overcome the shortcomings of NGVs (perceived or real) and to entice enough customers to switch their transportation fuel. This begs the question of whether the current and future fuel price differentials will be sufficient to enable a different result in the current decade.

Ultimately, the LDC and other potential investors will have to answer for themselves the question of whether or not pricing differentials are likely to be sufficient for sustained mainstreaming of NGVs. In seeking this answer, considerations regarding both historical and projected future price differentials between natural gas and liquid petroleum fuels are briefly discussed below.

Historical Price Differentials

Since the turn of the century, the retail price difference between gasoline and CNG at refueling stations has averaged around $0.71 per gasoline gallon equivalent (GGE), with a particularly consistent and relatively large price differential over the past three years (Figure 2.1). The suggested trend of increased price differences between natural gas and liquid petroleum fuels is more strikingly seen by the ratio of spot prices for light sweet crude oil and natural gas (Figure 2.2).

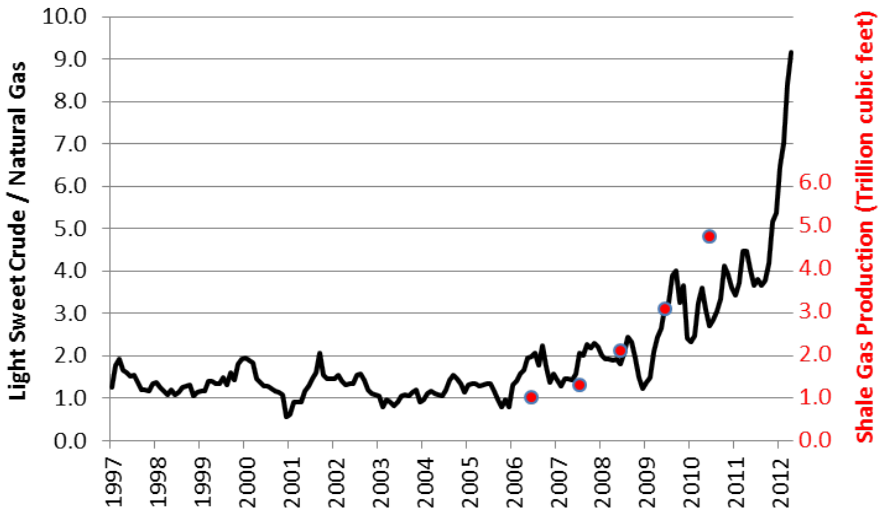
Figure 2.1 Average US Retail Prices* for Gasoline and CNG ($2010))



* Includes Federal and State motor fuel taxes.

Source: U.S. Department of Energy, Clean Cities Alternative Fuel Price Report

Figure 2.2 Spot Market Price ratios of West Texas Intermediate (WTI) Light Sweet Crude and Henry Hub Natural Gas, and US Shale Gas Production



Source: spot market prices and shale gas production as reported by U.S. Energy Information Administration (EIA)

A three-year trend is not typically sufficient for acceptance of a long-term change in a price differential (i.e., a new price paradigm). However, the case for price paradigm shift is strengthened by recognition of the expanded production of domestic natural gas from unconventional shale gas sources due to technological advances in hydraulic fracturing and horizontal drilling. Figure 2.2 displays US annual shale gas production from 2006 to 2010 as solid red circles.

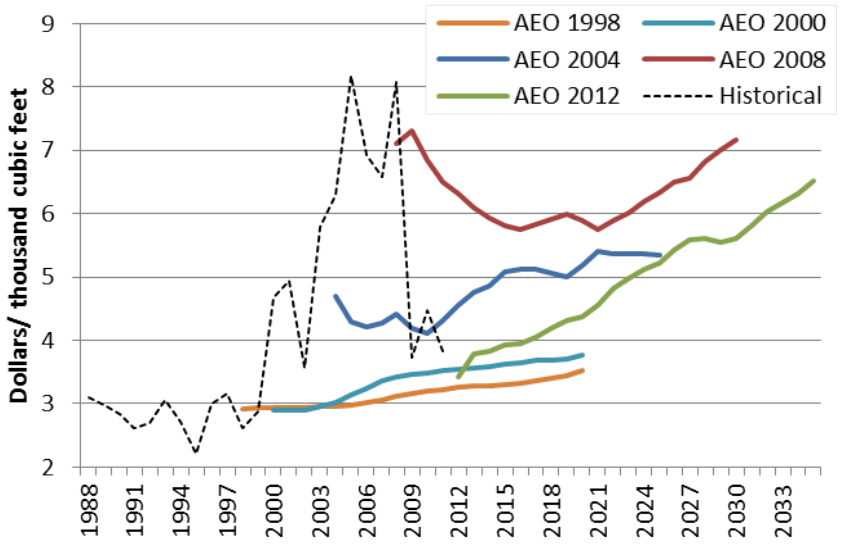
The consistent annual increases in shale gas production in conjunction with estimates of high volumes of economically recoverable domestic shale gas reserves support a continued trend of increasing domestic production of natural gas. In conjunction with slowly decreasing crude oil production, these production trends are commonly thought to be drivers of the pricing trends seen in both Figure 2.1 and Figure 2.2. However, particularly as the price of crude oil increases, domestic shale oil production may also increase, reducing interest in shale gas production and essentially limiting increases in the price differential of these two fuels. Overall, the current short-term trends as indicated in Figure 2.1 cannot confidently suggest a long term shift in the pricing differential of natural gas and liquid petroleum fuels.

Forecast Confidence

Sophisticated price forecast models incorporate recent price differentials in natural gas and liquid petroleum fuels along with both domestic and international economically recoverable reserves and a wide array of other factors. The forecast published annually by the US Energy Information Administration (EIA) is perhaps the most commonly cited of these forecasts.

Figure 2.3 displays historical natural gas wellhead prices (i.e., based on actual prices) along with EIA's forecasts of natural gas prices as published in the years 1998, 2000, 2004, 2008, and 2012. The dashed line represents historical (actual) prices, and the five solid lines represent the forecasts. The substantial changes in these forecasts over the years and their consistently poor ability to accurately forecast relatively near-term prices suggests the difficulties in forecasting, due in no small part to the wide array of factors that affect these prices. This is not to discredit the methodology, it is only to show that energy commodity prices are difficult to forecast correctly, and as a result there is a large element of uncertainty in these projections.

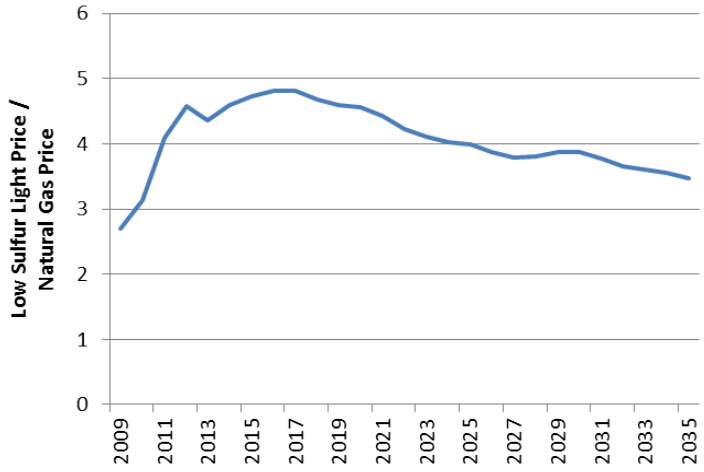
Figure 2.3 Historical and Forecast Prices for Natural Gas, Lower 48 Wellhead Prices (2010$)



Sources: EIA's Annual Energy Outlook (AEO), 1998, 2000, 2004, 2008, 2012, converted to 2010$ based on consumer price indices for all urban customers as published by the U.S. Department Of Labor, Bureau of Labor Statistics.

Recognizing that if divergence of actual prices from forecast prices is similar for both oil and gas, the price differential (critical for NGV adoption) will be maintained, Figure 2.4 displays the ratio of oil to gas for EIA forecast data, with 2009 through 2011 representing historical data. Unfortunately, historical and forecast datasets for liquid petroleum fuels have reflected different price points in the supply/delivery chain making comparison of the ratios of historical actual prices to previous forecast prices problematic.

Figure 2.4 Price Ratios of Forecast Light Sweet Crude and Henry Hub Natural Gas



Sources: EIA's Annual Energy Outlook (AEO), 2012, data for "Low Sulfur Light Price" per barrel converted to $/MMBtu assuming 5.775 MMBtu per barrel.

Overall, the difference between actual and forecast prices represents a risk that today's investors in NGV programs must be comfortable with.

2.4 Technological Competitiveness

One of the main reasons given for the limited success of past efforts to mainstream NGVs is the immature status of the technology. Indeed, the market expansion efforts of the late 1980 and through the 1990s were hindered by poor performance of vehicles, refueling equipment, and the support infrastructure. At least in part, these were natural growing pains with a new technology.

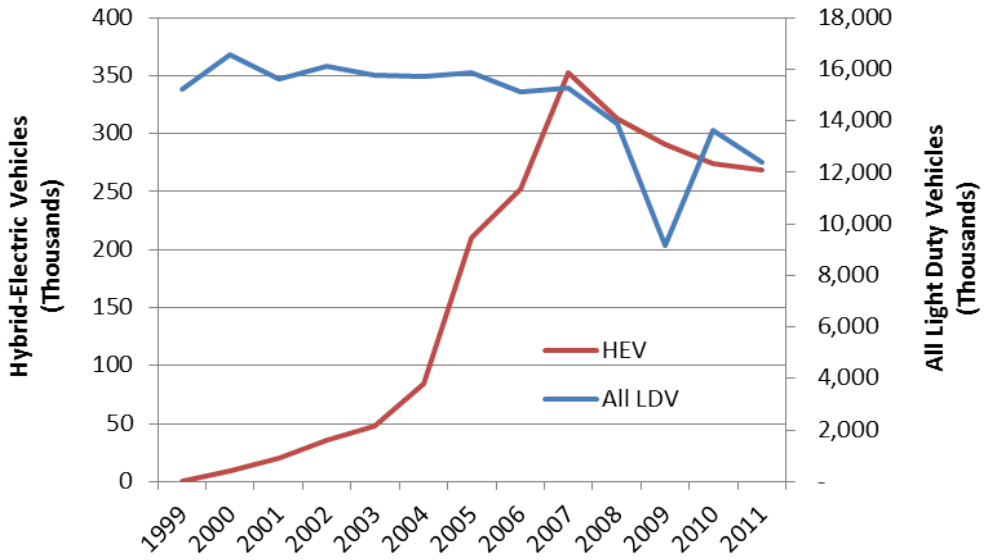
In recent years substantial progress has been made to improve vehicles, fueling systems, and provide a range of OEM vehicle types. While the new breed of engines are claimed to have addressed the issues of the past, few if any currently-offered heavy duty engines have been in service for their expected operating life.

The NGVs available today are impressive in their variety, representing just about every major, heavy duty, truck manufacturer and several well-financed and technologically advanced small volume manufacturers (SVM) and system converters. Prices are all at a premium to their diesel equivalent, with original equipment manufacturer (OEM) heavy-duty vehicles at a premium of $70,000 to $100,000, and

SVM conversions at a premium of $30,000 to $60,000, depending on fuel storage volume and other factors. Mainstream adoption of NGVs requires this premium to be paid back through fuel savings in a minimum period of time (i.e., less than 3 years), and it requires that the user's experience with NGVs to be positive enough for them to want this technology for their next vehicle.

Competing technologies represents another key risk for NGV projects. NGV technology must compete not only with conventional transportation fuels, but also with other alternative propulsion systems. In recent years, hybrid electric powertrains with conventional liquid fuels have proven a very competitive technology in both the light-duty vehicle market and in the transit bus market. Figure 2.5 shows the growth in annual sales of light-duty hybrid vehicles compared to sales of all light-duty vehicles.

Figure 2.5 Annual Sales of Hybrid-Electric Vehicles and All Light-Duty Vehcles



Sources: Hybrid-Electric Vehicle (HEV) sales from multiple sources as compiled by the National Renewable Energy Laboratory. All Light-Duty Vehicle sales from U.S. Environmental Protection Agency (2012). Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2011.

From 2007 through 2011, hybrids have composed slightly more than two percent of light-duty vehicle sales (and over three percent in 2009, the year with sharp drop in auto sales and Cash-for-Clunker incentives). The hybrid price premium is around $3,000 to $6,000, which is thought to be a substantial factor limiting their market penetration. This compares to a $5,000 to $10,000 premium for light-duty NGVs.

The rapid acceptance of hybrids may increase general comfort with marked changes in mainstream vehicle propulsion systems, which for many decades did not change from a user perspective. However, the addition of propulsion system differences to the list of mainstream, new-purchase vehicle considerations suggests the need for a substantial educational component in the shopping experience.

Although the transportation market may be seeking reductions in the use of liquid petroleum fuels, there are multiple paths for achievement of this goal. In both the light-duty vehicle market and the

transit bus market, as hybrids become more established, the perceived advantages of natural gas may be reduced. In contrast, in the heavy duty vehicle market (with exception of transit buses), natural gas has virtually no competition from another readily available alternative propulsion system.[6]

In the heavy-duty, long-haul trucking market, both CNG and LNG are being promoted in certain regions along with development of a refueling infrastructure along key corridors.[7,8] Aside from refueling infrastructure development, reliability and maintenance are particularly key factors in the long-haul trucking market where operations are often 24/7, with schedules that have little tolerance for delays.

Overall, uncertainties in the maintenance, reliability, and performance of NGVs and their refueling compared to both conventional and other vehicle powertrain types represent significant risks for the mainstreaming of NGVs. Investors in NGV programs should be comfortable with these risks.

2.5 Island Sustainability and National Infrastructure

Goals for the establishment of natural gas as a sustainable mainstream transportation fuel across market sectors include the development of a public refueling infrastructure that provides fuel across the nation within a comfortable drive range of standard vehicles. If this vision is not fully realized, NGVs may alternatively become mainstreamed in limited geographic areas and/or in a selected market sectors or subsectors. This partial mainstreaming, or islanding, of NGVs presents another risk for NGV projects.

Island markets have evolved with success, as exemplified by diesel fuel, which almost entirely replaced gasoline in long-haul trucks, buses, heavy-duty construction equipment, and other heavy-duty applications. However in the US, diesel has remained a minor player in light-duty vehicles, especially in passenger cars. California was established as a CNG island in the mid-1990s, aided by various state policies and regulations. The California CNG island remains viable and expanding today. More recently, southern California has become a geographic and market subsector island for heavy duty LNG trucks, particularly in the Long Beach area. This is primarily due to state policies promoting low emission vehicles and recent alternative fueled truck goals (with associated incentives) set by the Ports of Long Beach and Los Angeles.

While NGV island markets, either geographic or market sector, may be successful, the growth and sustainability of these islands are less certain. If the islands are not sufficiently close, they may be

6 It should be noted that fuel cell technology (which can use natural gas) poses a potential future competitor for internal combustion natural gas engines. Barring a series of technological breakthroughs that include substantial reductions in fuel cell cost, this technology is not viewed as a potential mainstream competitor within the decade.

7 Margaret Ryan, "Trucks can keep on trucking, LA to Salt Lake", February 7, 2012, AolEnergy. As viewed at: http://energy.aol.com/2012/02/07/lng-trucks-can-keep-on-trucking-la-to-salt-lake/

8 "Supply Chain Fleet Operators Increasingly Turn to Natural Gas Power", March 26, 2012, Seeking Alpha. As viewed at: http://seekingalpha.com/news-article/2285271-supply-chain-fleet-operators-increasingly-turn-to-natural-gas-power

insufficient for mainstreaming natural gas as a transportation fuel. Some of the reasons for the limitations of geographic island markets include the following:

- They require substantial use of bi-fuel or more conventional-fueled vehicles for traveling beyond the boundaries of island;
- Their use of conventional fuels in bi-fuel NGVs detracts from the price advantage offered by CNG or LNG;
- They present a reduced attractiveness to own or operate NGVs;
- Their small size may delay or discourage the development of support infrastructure (e.g., service, parts);
- They may be particularly vulnerable (threatening sustainability) if they are based on local incentives, which can and usually do expire.

Market sector or subsector islands share some of the same limitations and potential limitations of geographically defined islands. For example, the early and rapid growth of CNG and LNG transit buses did not lead to the expansion of the nearby infrastructure, nor did it lead to significant adoption of NGV in the area. In fact, the nature of fueling operations at transit agencies made the refueling infrastructure inaccessible to the general public. Furthermore, even though the use of CNG and LNG in transit buses is among the most economical NGV applications, their share of the transit market has eroded from about 30 percent of the market in the late 1990s to below 20 percent in 2010. This is partially the result of competition from hybrid electric buses, and partially due to the small size of the market, which has made the development of a competitive support infrastructure difficult and limited the benefits of economies of scale. (Other factors, including maintenance and performance issues were also contributing factors.)

Overall, geographical or market sector island markets may contribute to the sustainable mainstreaming of natural gas as a transportation fuel if their island status exists only for a short time. When a fuel island stops growing or otherwise becomes stagnant, user confidence can be eroded by the inefficiencies (as noted above), and shortcomings result in disengagement from the market.

3 Identifying Models

Ultimately, a model should have defined goals with clear objectives to achieve these goals, along with measureable targets for success. For LDC's considering development of NGV programs, these goals, objectives, and targets are not fully defined – and may not even be partially defined. The purpose of this chapter is to provide a series of questions with related discussions to assist an LDC in determining both the basic type of model(s) most appropriate for their organization, and the most appropriate role for their company with respect to NGV market development.

The discussion presented in this chapter assumes that LDCs have an overall interest in the long-term, economically sustainable development of NGVs, and that this interest overrides interest in maximizing nearer-term revenue and profits. Further, it should be recognized that there is no approach to market expansion that is without concerns, but thoughtfully designed strategies can do much to mitigate these concerns.

The general process for model development as presented in this chapter begins with identification of the appropriate model types (i.e., rate-based, non-rate-based, and commercial) to pursue based on an LDCs internal approaches to investment and the associated regulatory environment. Goals and objectives may then be determined from an assessment of the local environment with respect to both realistic market potential and competition. Both risks and benefits are considered throughout this process.

3.1 Types of Models

Models applied by LDCs fall within three general categories: rate-based, non-rate-based, and commercial – the latter of which is applied by an unregulated LDC affiliate rather than the LDC itself. These categories are distinguished by who the investors are and who bears the financial risk. Model types may be combined to create hybrid models customized to a particular LDC and its affiliates. Assuming a goal of long-term sustainable NGV market development, the preferred NGV business model(s) for a particular company is affected by their approach to investment risk, and their confidence in the approach of "seeding" or "jump-starting" new markets.[9] Descriptions of each of the three basic model categories are provided in below:

- **Rate-based Model** – This model is used by LDCs with NGV activities that are allowed in their rate-base. Expenses are typically capped, or have an expiration date, or both. Allowable activities may

9 There are examples of both successful and unsuccessful "seeding" of markets. Successes have been repeatedly seen in the pharmaceutical industry. In contrast, seeding the E85 market with refueling stations and flexible fuel vehicles has had modest success – unfavorable fuel price differentials have undoubtedly been an important factor.

range from marketing, education, demonstration and testing, to financing and infrastructure build-out. Under the rate-based model, investment is made by the LDC's investors but is reimbursed by the customers with a fixed ROR as set by the regulatory commission. Where, when, and what NGV projects are invested in may not be based solely on financial criteria, and may be limited by the regulators.

Risk is typically borne in whole or in part by the LDC's customers. If losses occur, they are covered by either the ratepayers or the LDC investors, depending on regulatory commission rulings. LDC investors generally assume less risk under this model compared to the other models, but their potential profit is the fixed ROR, as set by the regulators.

The manner in which risk is handled under the rate-based model allows lower consumer prices, but also carries the risk that some customer operations may not be viable with a later shift to higher commercial fuel prices (an inevitable result of LDC programs that are limited in duration). Carefully designed programs can address these and other commercial concerns through strategies such as:

- ***LDC targeting of marginal markets that are not currently targeted by commercial efforts***. These marginal markets may be geographic or by market sector. This approach may effectively help jump-start NGV adoption, with the higher risks of developing fringe markets carried by the ratepayers in exchange for the general public benefits of NGV adoption. Long-term success of these programs depends on later cost shifts of either fuel or vehicles that will make the economics of NGVs more favorable in the future. This approach may include the transferring of some LDC services to commercial companies when economics become more favorable. If more favorable economic conditions do not develop, marginal markets may need continued subsidies to remain viable, or be lost from the NGV market with potential associated negative media.
- ***LDC incentives for NGV adoption and/or commercial refueling station development***. As above, incentives may encourage NGV adoption by users for whom NGVs would not otherwise be economically viable, or for whom the economic benefit is likely, but a larger benefit is needed to entice NGV adoption. Greater certainty in sustained NGV use can be promoted by requiring economic feasibility without incentives to be a condition of obtaining the incentive. This type of jump-starting may help to more quickly develop a robust NGV market and infrastructure without negative impacts on market competition within the NGV industry.
- ***LDC support of NGV adoption through educational outreach***. LDC efforts can provide information regarding NGVs to targeted markets, provide assistance with independent economic feasibility assessments, and serve as example early-adopters through conversion of their own fleets to natural gas.

- **Non-Rate-based Model** – This model is used by LDCs to conduct activities that directly or indirectly support NGV development, the cost of which is not allowed to be passed on to the LDC's customers. In some cases, the LDC may be able to collect their commission-fixed ROR on these shareholder investments. These activities may be the same as those listed under the rate-based model, but have been ruled as unallowable by the regulatory commission due to differing circumstances (e.g., commission policies, presence of similar active commercial services, etc.). Under the non-rate-based model, both investment and risk of NGV projects is borne by the LDC's shareholders. Typically, LDC investors do not make large investments into NGV projects under this model because they may assume all project risks, and do so with a ROR that is capped by the regulatory commission.

- **Commercial Model** – This model is used by unregulated affiliates of LDCs such as commercial companies under the same parent or holding company, although it is also applicable to unaffiliated commercial companies. These firms are typically involved in NGV infrastructure build-out. The NGV project investors are the same as the company investors. Determination to pursue a particular NGV project is based on common commercial investment criteria including return on investment (ROI), ROR, and payback period, which are adjusted based on project risk. Under the commercial model, risk is borne by the company's investors. In exchange, their potential profit is whatever the market will bear.

Hybrids of the above models may also be applied in which two or three of the above model types are mixed for the same or different activities, which may shift as NGVs gain a greater share of the vehicle market.

3.2 Questions for Model Selection

The following questions and responses should help identify which model types should be explored for a particular LDC. Many organizational structures are conducive to more than one general model type. In the early stages of model development, model options should be kept broad, and recognize that where multiple models are applicable, all models may not begin at the same time, but they should all be designed to maximize overall, long-term success.

Should the rate-based model be pursued?

While there are many ways an LDC may consider whether or not to pursue rate-based NGV projects, any NGV investment decision, including the conversion of their own fleet, is strongly influenced by the LDC goal for increasing load, market characteristics of fleets in their territory, and the regional price differential between natural gas and conventional fuels. These factors can be considered through the following steps:

1. Establish the amount of transportation fuel load that the LDC would currently like to achieve based on their system capacity and current load curves.

2. Develop a series of economic feasibility studies for various market sectors (i.e., fleet types) to determine the volume of fuel they would need and the maximum price each sector can pay for natural gas to still be an attractive, competitive fuel.

3. Compare the LDC's transportation fuel load goals to the sum of transportation fuel volumes for all fleets that can pay maximum fuel prices at or above commercial refueling station prices and still be economically viable. If these volumes are at or above the LDC's transportation fuel load goal, the goal may be achieved through a commercial model, with or without the assistance of the LDC. LDC support may range from customer education to incentives for NGV adoption. The magnitude of support, and whether these are rate-based or unallowable activities (investments) will indicate whether or not the LDC should petition the regulatory commission for rate-basing their NGV program. Otherwise, if the volumes indicated by the analysis conducted in this step are below the LDC's transportation load goal, proceed to Step 4.

4. Compare the LDC's transportation fuel load goals to the sum of transportation fuel volumes for all fleets that can pay maximum fuel prices at or above LDC refueling station prices and still be

economically viable. If these volumes are at or above the LDC's transportation fuel load goals, rate-basing the LDC's NGV-related activities is likely needed to obtain their load goal in a timely manner – potential rate-based strategies are discussed Section 4. If the LDC's load goal cannot be met with LDC refueling prices, the transportation load goal they have set is too high.

Table 3 displays a hypothetical, high-level feasibility assessment of an LDC station open to the public, a similar sized commercial retail station, and a smaller retail station. This table exemplifies the significant pump price differences that are feasible at LDC refueling stations versus commercial stations. It also exemplifies the lower pump prices that can be achieved at larger retail stations versus smaller stations.

Table 3 Hypothetical Economic Analysis of LDC and Commercial Fast-Fill NGV Refueling Stations

	LDC	Large Retailer	Small Retailer
Total Non-land Capital Costs ($)	$1,000,000	$1,000,000	$600,000
Less: Incentives ($)	$100,000	$100,000	$100,000
Net Capital Costs ($)	$900,000	$900,000	$500,000
Estimated Salvage Value @ 10% ($)	$100,000	$100,000	$60,000
Natural Gas Cost ($/GGE) *(includes transport and local distribution)*	$0.68	$0.68	$0.68
Total Natural Gas Cost ($/year)	$204,000	$204,000	$102,000
Electricity Charge ($/GGE)	$0.06	$0.10	$0.12
Total Electricity Cost ($/year)	$18,000	$30,000	$18,000
Equipment Maintenance/Admin. ($)	$54,000	$60,000	$30,000
Marketing ($)	$10,000	$30,000	$20,000
Insurance ($)	$15,000	$25,000	$20,000
Credit Card Fees ($)	$8,550	$23,400	$12,600
Federal Motor Fuel Tax at $0.184/GGE ($)	$55,200	$55,200	$27,600
State Tax Motor Fuel Tax at $0.15/GGE ($)	$45,000	$45,000	$22,500
Depreciation Expenses ($) (straight line method)	$53,333	$53,333	$29,333
Years of depreciation	15	15	15
Interest Expense/ Cost of Capital ($)	$18,000	$72,000	$40,000
interest rate	2%	8%	8%
Total Expenses ($)	$481,083	$597,933	$322,033
Total Quantity Gas Sold (GGE)	300,000	300,000	150,000
Price at pump, includes taxes ($/GGE)	$1.90	$2.60	$2.80
Total Revenue ($)	$570,000	$780,000	$420,000
Annual Net Income ($)	$88,917	$182,067	$97,967
ROI	9.88%	20.23%	19.59%

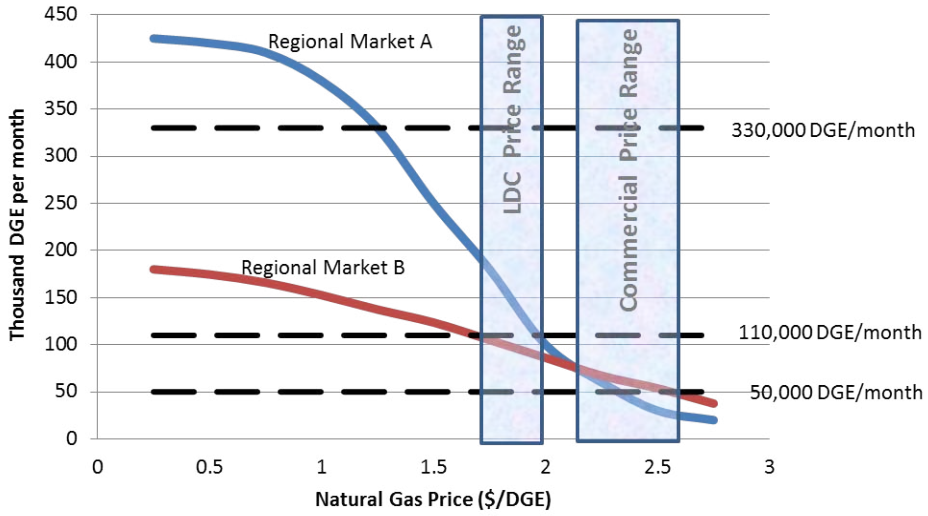
As an example, consider two market scenarios, one in which there is a larger number of potential NGV fleets but they are very price-sensitive (Regional Market A), and another in which there are fewer potential NGV fleets but they are less price-sensitive (Regional Market B). Next, consider the following different examples of LDC goals and feasibility study results (visually exemplified in Figure 3.1):

- The LDC transportation fuel load goal is 50,000 DGE per month. Feasibility studies suggest this goal can be achieved with prices at or below $2.30/DGE in Market A and at or below $2.60/DGE

in Market B, both of which are within the range of commercial prices. Under both of these market scenarios, the LDC goal can be reached by supporting the commercial operators through activities such as providing NGV information.

- The LDC transportation fuel load goal is 110,000 DGE per month. Feasibility studies suggest this can be achieved with prices at or below $2.00/DGE in Market A and at or below $1.70 in Market B. Market A is within the price range estimated for LDC refueling stations, but is lower than prices estimated at commercial stations. In contrast, Market B is about at the limit of prices estimated for the LDC and below that of the commercial refueling stations. Under this scenario, the LDC goal can be reached in Market A, and possibly in Market B. The commercial prices would not be viable for this volume in either market.
- The LDC transportation fuel load goal is 330,000 DGE per month. Price range estimates at both LDC and commercial refueling stations are too high to achieve this goal in Markets A and B.

Figure 3.1 Examples of Demand versus Price and LDC Load Goals



When commercial prices are too high for economic feasibility, such as for both Markets A and B to achieve a monthly load of 110,000 DGE/month, the LDC may either:

- Delay or forego the opportunity
- Seek regulatory approval to provide incentives (note that Market B would require very little incentive to be viable)
- Adjust the load goal

Theoretically, proposed incentives should be less costly than the total benefits from added use of NGVs.

It should be noted that in cases where the LDC over-stimulates the market by providing refueling at LDC prices (e.g., Market A for achievement of more than 110,000 DGE/month), the results may or may not be desirable. The desirable case is obvious – more gas is sold. The undesirable may occur under a variety of situations when the goal represents a firm limit (e.g., available or allowable capacity, funding for build-out, etc.). Further, to avoid later disgruntled customers, the LDC will need to continue

providing fuel at LDC prices until the differential between commercial natural gas and conventional transportation fuels is sufficient to allow customer-fleet viability at commercial prices.

Should the non-rate-based model be pursued?

The most beneficial actions pursued under this path will depend on both the budget and the current status of NGV markets in the LDC territory. As with consideration of rate-based programs, a careful analysis of current and potential NGV markets in the LDC territory should be conducted. The results of this analysis, along with identification of the available budget for unallowable NGV-related expenses will indicate what types of programs may be most beneficial.

Should the commercial model be pursued?

Assuming a continued favorable price differential between natural gas and conventional transportation fuels, the commercial model is the most dependable path for long-term, continuous, economically sustainable expansion of NGV markets because it does not depend on regulatory approval. As such, the commercial model can also offer the greatest returns. However, the commercial model can only be implemented by unregulated companies, such as commercial affiliates of an LDC. With the deregulation of the gas industry, any LDC can establish or purchase a separate, unregulated company for these purposes. Pursuit of this path indicates a strong commitment to NGVs.

Commercial affiliates of an LDC may provide services that an LDC is either told (by regulators) to not pursue, or chooses to not pursue. Some LDC officials interviewed believe that market competition is essential for both the establishment and sustainment of natural gas as a mainstream transportation fuel. This belief suggests a more limited role for regulated LDCs, essentially excluding them from providing refueling services due to the advantages provided the LDC, which result in lower prices at the pump making it difficult for commercial firms to compete. This can prevent commercial firms from entering the market, or if already active, can lead to market abandonment, and create other market disruptions including monopoly-like market conditions.

Organizations using the commercial model are competitive, profit-oriented, and target economically viable projects that minimize risk and maximize the return. They make their investment decisions on company-specific, risk adjusted, criteria such as: defined expected return on investment (net present value of an income stream), payback period (usually between 2 and 4 years), rate of return (commonly above 15 percent), or some combination of each.

The component that is most strikingly different in the commercial and rate-based models is the way in which risk is perceived, internalized, and compensated. Another significant difference is that unregulated commercial firms have much greater flexibility in adjusting their investment criteria. This flexibility allows consideration of the firm's long-term return and associated portfolio income over individual project income. Investment criteria may be loosened in response to the need or desire to enter a specific market; to attain a competitive position; or to attract a new market (e.g., refuse hauling).

This differing treatment of risk and investment criteria flexibility accounts for the price difference typically seen between commercial refueling stations and LDC-owned refueling stations.

4 Identifying Strategies

Strategies for each of the three basic model types described above (i.e., rate-based, non-rate-based, and commercial models) are address separately below. Examination of strategies begins with consideration of questions, the answers to which will help focus on the strategies that may be most appropriate under a particular LDC, or LDC affiliate's circumstances. In cases where a hybrid model may be most effective, strategies for each considered basic model types should be considered and coordinated.

4.1 Rate-based Model Strategies

Strategies used in rate-based models for NGV market development are typically proposed by the LDC, may be modified based on regulatory commission concerns, and are ultimately accepted or rejected in a commission ruling. The ultimate ruling is affected by the regulatory commission's approach to gas market expansion; their confidence in the assessment of NGV market potential as presented in the LDC's petition (i.e., risk); as well as comments received on the petition.

For LDCs with traditional, volume-based revenues, the advantages of NGV market expansion are obvious. However, roughly one-third of the states have delinked (e.g., decoupled) LDC revenue and sales volume. Of these states, only California and Massachusetts include industrial volumes in their decoupling mechanism.[10] As such, there is substantial precedent for excluding particular end-use categories from decoupling or other delinking mechanisms. This exceptional treatment for vehicle fuel use may be of greatest interest in states that have policies for greenhouse gas reduction due to the lifecycle emissions reductions associated with natural gas versus conventional transportation fuels.

Commission approved strategies are often quite limited in their ability to be altered without a subsequent petition process, as such, there is generally less frequent modification of approved rate-based strategies compared to commercial strategies that have unrestrained flexibility. The questions provided below are to help in the selection of strategies that may be used under the rate-based model. The discussion provided under each of these questions includes examples of LDC strategies that are currently being used. Table 4 lists these examples along with their allocation and relative level of risk.

10 Glatt, Sandy and Myka Dunkle, July 2010. Natural Gas Revenue Decoupling Regulation: Impacts on Industry. US DOE State Policy Series. As viewed at http://www1.eere.energy.gov/manufacturing/states/pdfs/nat-gas-revenue-decoupling-final.pdf

Table 4 Allocation of Risk Under Example Rate-based Strategies

Strategy (Based on risk exposure by LDC)	Risk Holder [1]			Example LDC
	LDC Shareholder	Other Ratepayer	User	
LDC-owned public refueling stations, no fuel contracts	Minimal	Primary	None	Questar Gas
LDC-owned public refueling stations, take-or-pay fuel contracts	Minimal	Secondary	Primary	Piedmont Natural Gas Company, Inc.
LDC compression services with tariff for recouping of costs from users	Minimal	Secondary	Primary	Southern California Gas
Grants, rebates, or loans for vehicle purchases; facility upgrades; refueling stations; training	Minimal	Secondary	Primary	FortisBC

[1] Primary bearer of risk; Secondary bearer of residual risk; and Minimal risk (i.e., impact of loss on ROR)

What is the current level of state or regional support for promotion of natural gas as a transportation fuel?

Both policy statements and actions in terms of funded programs should be considered to indicate the level of state or regional interest in developing natural gas as a transportation fuel. Regulatory commissions in states that demonstrate a high level of interest in NGV expansion may be more likely to support LDC petitions for rate-basing of NGV programs. As such, the level of state or regional policies and regulations addressing natural gas vehicles can enable rate-based LDC strategies for expansion of NGV markets. Some key rate-based strategies and examples are discussed below.

Rate-based Refueling Infrastructure Below the Cost of Service

Given the limited use of below cost-of-service strategies, clear indicators of where this strategy may be most successful are not defined, however, it is reasonable to suggest that states with policies and associated regulations that support growth of NGV (or "clean fuel") markets may be the most likely to allow this strategy. The policies driving these regulations may be for goals to reduce emissions (i.e., greenhouse gases), improve energy security (i.e., use of domestic fuels), or increase domestic employment. Examples of strategies for rate-based refueling prices below the cost of service are seen in Utah and British Columbia, as described below: Utah is the only state that currently has NGV refueling below the cost of service. A less-than-full cost of service rate was established for all natural gas refueling stations in Utah as a result of legislation passed by Utah State Legislature in 2009. The legislation provided the public service commission with authority to establish NGV refueling rates that are less than the full cost-of-service and to spread the remaining costs to other customers (Utah Code, 54-4-13.1).

There are many other regulations in Utah that support a policy of promoting natural gas as a transportation fuel, although many of these policies address natural gas as one of several qualified clean fuels. Since the 1990's, a provision in the Utah Code allows establishment of the mandated use of clean

fuels (including natural gas) by centrally refueled fleets with 10 or more vehicles (Utah Code, 19-02-105.3). Further, the state offers an income tax credit for purchase of "clean fuel" vehicles; has an ongoing grant and loan program for purchase of NGVs; has High Occupancy Vehicle (HOV) lane exemptions for clean-fuel vehicles; and has provided for public access to state CNG refueling stations when commercial stations are not in the area.

The LDC in Utah, Questar, views these programs as support for jump-starting the NGV market – the current policies and regulations are intended to be temporary. Questar's rates get reviewed annually and as such can be suspended. A Questar official interviewed for this project estimates that when the favorable NGV rate are suspended, CNG prices at Utah natural gas refueling stations are expected to increase by about $0.20 per GGE.[11] This is a relatively low price increase largely due to the fact that many of the stations were built and depreciated a long time ago and were later refurbished with the aid of federal funds. Further, the new stations were built with Federal grants paying for up to 70% of their cost. More realistic differences between LDC and commercial station pump prices are presented in the examples shown in Table 3 Hypothetical Economic Analysis of LDC and Commercial Fast-Fill NGV Refueling Stations (above). The small estimated prices increase at Questar, may provide little risk that current NGV users will abandon NGVs. This is particularly the case since commercial stations in the Questar service area are charging prices that are between the Questar price ($1.50/GGE) and $2.00/GGE. However, in other areas where the deregulated price difference may be higher, those with marginal economics (i.e., due to low fuel use) may cease to have sufficient economic benefits from NGVs.

While the subsidy of natural gas pump prices is not now scheduled to end, Questar is strongly signaling their dedication to the NGV market and confidence that the economics of NGV adoption can be acceptable without subsidies by their establishment of a non-regulated affiliate. Their new affiliate is currently searching for their first commercial opportunity, and to the extent allowable, may draw from Questar's experience. If successful, Questar will ultimately be implementing a hybrid model with a rate-based jump-starting of the Utah NGV market followed by likely modification of their rate-based model in addition to establishment of a non-regulated affiliate to implement a commercial model. As this shift occurs, the bulk of NGV risk will move from the ratepayers to the commercial company investors and their contract partners.

A second example of a large rate-based NGV program was approved in May 2012, when the Lieutenant Governor in Council of British Columbia, Canada ordered regulations under the existing Clean Energy Act for greenhouse gas reductions through public utility natural gas vehicle programs.[12] The new regulations enable FortisBC to rate-base expenditures and to offer incentives for fleets such as buses,

11 Telephone interview, April 25, 2012 and June 12, 2012.

12 Documents as posted by the British Columbia Utilities commission: Letter from the Utility Commission to FortisBC dated May 17, 2012; and Letter to the Utility Commission from FortisBC dated May 16, 2012 with attachment of the May 14, 2012 order of the Lieutenant Governor in Council. As viewed at: http://www.bcuc.com/Documents/Proceedings/2012/DOC_30671_05-17-2012_Request-Comments-Section-18-CEA.pdf

trucks or ferries to adopt natural gas as a transportation fuel. Total program expenditures may be up to $104.5 million by April 1, 2017 (the program's end date).

Incentives in the FortisBC program may include grants for zero-interest loans for the price difference between NGVs and comparable conventional-fueled vehicles, and grants for training and upgrades to maintenance facilities to safely maintain natural gas powered vehicles. FortisBC is also prescribed to purchase or build, and operate compressed natural gas or liquefied natural gas fuelling stations at which at least 80% of the energy provided is under take-or-pay contracts with a minimum term of 5 years. FortisBC believes that as natural gas use as a heavy-duty transportation fuel matures, incentives will no longer be necessary.

As in the Questar example, the aim of FortisBC's rate-based NGV programs is to increase the rate of NGV adoption over the rate seen in recent years. In the BC case, there are already more than 20 public refueling stations operating in the province. The details of FortisBC strategies are not yet determined and the impact on the existing CNG stations and the current users of those stations is not yet known. If loss of commercial refueling stations becomes a concern, a variety of different strategies may provide mitigation. Examples include locating LDC refueling stations beyond the areas served by existing commercial stations; seeking a lower rate for commercial refueling stations to put their prices on or near parity with LDC station prices; or exploring the potential for public-private partnerships in the establishment of new stations and/or in the purchase of existing stations through the program's set end date.

Rate-based Refueling Infrastructure with Amortized, Full Cost-of-Service

A rate-based refueling station or rate-based compression for a refueling station with fuel priced to include full cost of service with amortized capital expenditures typically provides a modest economic incentive for NGV adoption beyond the economic incentive available from commercial refueling stations. The fuel pricing advantage of rate-based stations versus commercial stations is due to different accounting and valuation of investment risks. A rate-based refueling infrastructure with amortized, full cost-of-service may accelerate NGV adoption beyond the growth rate that would be seen with commercial (non-regulated) refueling.

An example of the amortized, full cost-of-service strategy is being implemented by Piedmont Natural Gas. Influenced by Hurricane Katrina, Piedmont saw a need to mitigate their exposure to a single fuel used in their vehicles and considered NGV as a risk-mitigation option. In 2011, Piedmont committed to having one-third of their fleet run on CNG, build stations accessible to the public, and attract nearby fleets to use CNG. Their program is just beginning to build NGV fueling infrastructure at customer sites under firm fuel purchase contracts. The contracts, referred to as Minimum Margin Agreements, must have terms of at least 5 years, and include minimum purchase volumes so that the customer pays the full cost of the facilities Piedmont's tariff has a rider for CNG sales service that allows a charge, in addition to a base margin rate, to explicitly recover the refueling station compression costs.

Under Piedmont's strategy, when consumption is below the contracted volume, the customer pays the difference (i.e., true-up). If fuel consumption exceeds the contracted volume, the difference can be credited to the following year's minimum margin amount when the Minimum Margin Agreement

expires, customers can choose whether or not to continue with the service; if the customer declines, the compressor, dispenser and meter can be redeployed to continue cost recovery of the equipment from another CNG customer.

The lower fuel prices available at Piedmont's refueling stations may encourage more customers to adopt NGVs in the near-term, but after some years, Piedmont's role in the stations could, of course, change. Designing strategies to reduce the chances of customers losing sufficient economic benefits of NGV use while later shifting to commercial fuel prices can facilitate a smoother future transition to commercial ownership of refueling stations. A second example of a rate-based refueling infrastructure investment with amortized full cost-of-service is currently being sought by Southern California Gas Company (SoCalGas). The SoCalGas version of this strategy varies in details. Under the proposal, SoCalGas will provide CNG to the customer with compression equipment located on the customer's site. The compression equipment will be owned and operated by SoCalGas. All equipment beyond the point of CNG delivery (dispensers, card readers, etc.) will be fully owned and operated by the customer.[13] SoCalGas will recoup their investment and compression equipment maintenance and operation costs through a tariff that capture the full cost of providing compression service.

Should SoCalGas be successful in receiving approval of this tariff, it will allow development of an NGV fueling infrastructure using ratepayer funds for the investment with a time-phased repayment through the compression tariff. This would constitute a blanket, system-wide ability for the utility to invest into NGV infrastructure without limits on time or funding. As such, it would be a very powerful tool in building out NGV infrastructure. (This service would not be offered to residential customers, and thus would not affect home refueling.)

What is the current level of LDC shareholder interest in investing in natural gas as a transportation fuel?

Shareholder interest in investing in NGV projects is important to understand in developing strategies for both rate-based and non-rate-based NGV business models. Shareholder willingness to take on some of the risk associated with NGV programs may increase the level of comfort the regulatory commission has with passing NGV risk on to the ratepayers. Particularly when the regulatory commission is reluctant to have ratepayers carry the risk of NGV investments (i.e., through allowing these investments in the rate-base), their view of this risk may be reduced by specifying that some or all of any program losses would be taken from profits (i.e., the shareholders) rather than from the rate-base.

Alternatively, shareholders may offer to fund a pilot program that if successful, will be used to develop a rate-based NGV program. This is the strategy that is currently being employed by National Fuel Gas Distribution Corporation. In brief, National Fuel obtained received approval from their regulatory commission for shareholders to invest a capped amount on an NGV program to be designed by National

13 Application Of Southern California Gas Company To Establish A Compression Services Tariff, Before The Public Utilities Commission of The State Of California; In the Matter of the Application of Southern California Gas Company (U 904 G) to establish a Compression Services Tariff; Application 11-11-___; (Filed November 3, 2011), Page 1 and 2.

Fuel. A return on the shareholder investment is allowed up to the LDCs standard fixed rate, while any loss of investment is carried by the shareholder. The regulatory commission will review the pilot program's progress and later determine if results are favorable enough to allow a similar, larger rate-based program. As such, at this time, the National Fuel program is a non-rate-based program (it is further described under non-rate-based strategies, Section 4.2).

What currently rate-based programs can be easily extended to include NGV programs?

Extension of currently rate-based activities to include some NGV-related actions may be acceptable for undertakings such as provision of general information on NGVs (e.g., on websites) and responding to inquiries from potential NGV users. Additionally, converting the utility fleet to natural gas based on cost saving may also be allowable, with the side effect of providing a good marketing tool. These types of actions may be started prior to full establishment of other aspects of a model for NGV programs.

4.2 Non-Rate-based Model Strategies

Strategies used in non-rate-based models for NGV market development depend on shareholder investment, the level of which may vary depending on whether or not the regulatory commission allows a ROR on these investments. The questions asked below are to help in the selection of strategies that may be used under non-rate-based the model. The discussion provided under each of these questions includes examples of LDC strategies that are currently being used. Table 5 lists these examples along with their allocation and relative level of risk.

Table 5 Allocation of Risks Under Example Non-Rate-based Strategies

Strategy (Based on risk exposure by LDC)	Risk Holder [1]			Example LDC
	LDC Shareholder	Other Ratepayer	User	
Pilot program funded by shareholders, able to receive the LDC's ROR	Secondary)	None	Primary	National Fuel Gas Distribution Corporation
Universal Fund grant for compression services at new stations with approved fee to recoup costs from users	None	None	Primary	The Atlanta Gas Light

[1] Primary bearer of risk; Secondary bearer of residual risk; and Minimal risk (i.e., impact of loss on ROR)

Are there funds available that do not require payback or for low-interest loans?

Funds outside the rate-base and independent from shareholder funds may be available for investing in NGV programs. Examples of these funds include grants and other state or regulatory commission controlled funds. Grants may be available from federal sources such as through the Clean Cities Program, or from state energy or environmental agencies. They may take a variety of forms including low-interest loans, tax incentives, and reimbursements for NGV conversion costs and refueling infrastructure. These incentives may be used by the LDC in conversion of their own fleet to natural gas, and may also be promoted by the LDC to their customers.

An on-going federal program known to provide funding to promote NGV adoption is the US Department of Energy's Clean Cities Program. A Clean Cities grant was used to finance construction of seven new NGV refueling stations in Utah as part of a larger effort to refurbish and expand the state's NGV refueling infrastructure in response to high gasoline prices in 2008.

While state grant sources are more likely in states with a policy to promote natural gas as a transportation fuel, there may be other unique funding sources. An example of a unique, potential state-level funding source is a Universal Service Fund (USF), as is being used by Atlanta Gas Light (AGL). Universal Service Funds have been established in several states (e.g., GA, MD, OH, NJ) as part of utility

restructuring for the purpose of providing assistance to low-income and hardship customers. Ratepayers are charged a designated fee that is deposited into the USF, which is administered by the regulatory commission. The regulations controlling USF use are broader in Georgia than in other states. In Georgia, one of the purposes of the USF is to extend and expand services in the public interest (Rules and Regulations of the State of Georgia, 515-7-5-.03).

AGL submitted an application with a detailed plan for use of funds from the USF to begin a CNG refueling infrastructure in Georgia. The plan was further developed in cooperation with the area's government representatives, and took about 14 months to receive approval for $11.57 million in program funds. The AGL program will be accomplished in multiple stages through revenue recirculation. In the first phase, now in process, a network of 9 CNG fueling stations will be constructed. AGL will install, own, and maintain CNG equipment for project developers, and the developers will provide land, dispensers, card-readers, and retailer functions. AGL will bill the CNG retailers for distribution and compression services under a new rate that includes their delivery charge and two additional charges. One of these charges is to recover AGL's operations and maintenance costs. The second charge, based on CNG equipment use, will be used to build a fund for Phase II activities.

Phase II funds (from Phase I refueling stations fees) will be used for three purposes. 1) to upkeep and eventually replace Phase I refueling equipment, 2) to buy-down 50% of the estimated cost of leases for 500 home refueling stations, and 3) to fund additional CNG refueling stations similar to the process in Phase I. It is the station owner's responsibility to find and sign up customers for a certain percentage of the capacity, which is a condition for receiving funding for the station. In Phase 2, a portion of the proceeds from Phase 1 of the program would also allow AGL to offer "affordable low-cost leases" of home refueling appliances to individuals and small businesses who own CNG vehicles.

If no grants or similar funding for initiating an NGV program are available, LDC may consider requesting such funds from well-endowed non-governmental organizations with stated interest in the environment or in promotion of domestic fuels or other natural gas stakeholders (e.g., producers). Absent federal programs for seeding the NGV infrastructure, other stakeholders can conceptually pool resources to help create corridors of NGV refueling infrastructure. With a program design similar to that used by AGL, the seed funds are recycled for new investments through a fee structure. As long as these programs are fashioned such that no expense or risk is carried by ratepayers and NGV-related fees are only applied to those receiving these services, ratepayers can receive the general benefits of project success with none of the risks. Under these conditions, a regulatory commission is less likely to have objections to the addition of fees for specific costs of service.

How much are LDC shareholders willing to invest in NGV programs?

The amount of funds that shareholders are willing to invest in NGV programs essentially establishes the minimum budget an LDC may have for promotion of NGVs. Examples of relatively low-cost programs include:

- Provision of information on NGVs as through websites and mailings to targeted customers, and responses to inquiries from potential NGV users

- Offering technical assistance in feasibility assessments of NGV adoption
- Conversion of the LDC fleet to natural gas for cost saving and marketing

When shareholders are willing to make a more substantial investment in NGVs they may consider funding a pilot program to strengthen a future petition to the regulatory commission for a rate-based program (as is being done by National Fuel). Alternatively, if the LDC can obtain approval for receiving a return on a program financed by shareholders, the program may continue without rate-basing.

In the case of National Fuel Gas Distribution Corporation, the New York Public Service Commission approved a shareholder financed (shareholder risk-exposed), pilot NGV program to help make the case for a future ratepayer funded NGV program. The LDC shareholders are allowed to spend up to $3.5 million to either fund refueling stations and/or aid in the purchase of NGVs. The capital investment is recoverable through a capital recovery rate, backed by a take-or-pay contract for a minimum quantity of future fuel purchases. The ROR on the investment will be the approved LDC ROR, set to be recovered within 6 years of project funding, with the returns excluded from the decoupling mechanism.[14] The pilot program is to expire on March 31, 2015.

At this early stage, the measurable success of this model is in the planning. Before National Fuel committed to the development of an NGV program, it explored the potential for NGV's in its service area. It purchased detailed fleet market data by zip code, type of vehicles, their size, and other characteristics. National Fuel approached each candidate customer to explore the NGV option in detail. The findings, which included that financing of NGVs may be needed, were included in the petition to the regulators. To simplify the process, National Fuel requested that this program be made part of an existing Distributed Generation program. The petition was approved with added program tracking and reporting requirements to allow for future program determination, which can include a rate-based NGV program.

14 The existing NGV usage is included in the RDM (Revenue Decoupling Mechanism), but NGV Pilot Program usage will not be similarly included. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={3033B874-D2F6-41B4-85AC-87163B212B4C}, Page 6.

4.3 Commercial Model Strategies

As unregulated entities, the strategies applied by commercial companies can often be much more tailored to project-specific needs and varied levels of partnering (i.e., means distributing risk) than can be applied in an LDC's projects. Within the commercial operating environment, firms use an assortment of investment options and many tools in a variety of combinations to form a project-specific strategy designed to achieve their goals. The strategy options, the key questions being answered, and the tools available to enact the strategy are presented in Table 6. A discussion of each question is provided in Sections 4.3.1 through 4.3.6.

Table 6 Common Investment Options for Commercial Firms Investing Into NGV Infrastructure or NGVs

Investment Type	Type Of Project	Financing	Ownership Relationship	Associated Functions	Associated Activities
What investment opportunities are being considered?	What projects are most appropriate to meet objective?	How should the project be financed?	What should be the ownership structure?	What developmental functions should the firm perform?	What project activities should the firm engage in?
Refueling Infrastructure - NGV refueling station - Transportation Service for LNG, CNG, or RNG - Build LNG or RNG capacity	- Own equipment - Own land - Partner in either/both - Lease either/both - Rent for fuel contract - Build for resale - Build to operate	- Equity - Debt - Partner - Venture - Grant - Incentives - Securitize - Guarantor - Credit	- Equity owner - Debt financier - General partner - Limited partner - Venture capitalist - Franchisee - Franchisor	- Plan - Site - Engineer - Construction Management - Build - Test/Launch - Finance	- Operate - Maintain - Manage/support - Fueling service - Consult & Train - Supply NG - Hedge - Insure - Use
NGVs separately or with investment in refueling infrastructure	- Own NGVs - Own NGV part only - Lease vehicle - Lease NGV part only - Lease to own - Partner w/fleet			- Convert vehicles - Refurbish facilities - Inspect fuel systems - Finance facility - Manage fleet	

Source: SAIC

*RNG refers to renewable natural gas, such as generated from agricultural waste or landfills.

In an organization that uses a rigorous evaluation process, the decision-making is done on a project-specific basis to yield a project-specific strategy. If a strategy works well, it may be formalized and may become the firm's application-specific or area-specific model. Formalized approaches are always company specific and not optimal for another firm with different objectives, strengths, weaknesses, etc.

As such, formalized commercial strategies are not presented, but examples that are loosely based on industry experience are presented in sidebars.

What investment opportunities are being considered?

The investment opportunities considered will likely be based on a market and capability assessment to determine where competitive advantage, profit potential, and investor interest is greatest. The choices are generally between opportunities for supporting the refueling infrastructure, and/or expanding NGV use. Refueling infrastructure opportunities may address private or retail refueling stations, or transport of fuel (i.e., CNG or LNG) to refueling stations, and/or building production capacity of LNG and/or RNG. For example, commercial firms may consider partnering with LDCs for shared use of LNG facilities that are typically used by LDCs for peak-shaving and are drawn from on only a few days each year. Similarly, a firm may partner with a municipality to build capacity to produce RNG. (See sidebar, Example 1.)

What projects are most appropriate to meet the objective?

There can be a number of different projects a commercial company can elect to take part in when investing in NGV markets. For example, to invest in NGV refueling stations it can own land, build stations in response to a specific demand (e.g., private fleet station) or as a speculative venture (e.g., public station), lease it for a fee, operate it, lease it under a fuel purchase agreement, sell it, or some combination of these and other projects. The selection of the right project should be based on a series of assessments, which include a determination of which projects can meet the objectives, what is in demand, where does the firm have the competitive advantage, what is the income stream, what is the risk exposure, is the risk controllable, and other evaluations. This assessment approach is most applicable when an LDC affiliate is

Example 1: LNG Production

Clean Energy Fuels Corporation (CEFC) is engaged in a program to make LNG available at 150 truck stops for use in LNG trucks. This program requires small, but increasing supplies of LNG to serve a small, but fast-expanding trucking market.

Clean Energy had the option to build, buy, or lease capacity to produce LNG, or contract for supplies of LNG. After examining available national resources, CEFC determined that its near-term requirement for the central region can be met by a peak-shaving facility in Omaha, NE. It decided that the type of project most feasible to meet their objective is to contract for the product from an existing facility.

On May 4, 2012 CEFC and Omaha's Metropolitan Utilities District (MUD) entered into a 15-year agreement for CEFC to purchase LNG to serve the area represented by a 200 mile radius from the Omaha facility. The MUD facility is used only several days a year to supplement available supplies. The rest of the time, it is an unutilized asset.

The agreement allows MUD to increase utilization, and if needed to increase the unit capacity through investment from CEFC. The utility benefits by improving system efficiency that will benefit the ratepayers, and by increasing its earnings.

considering market entry or when they have developed an opportunity. However, very often the project is defined by a potential client.

The selection of a project is critical to meeting goals and defining how the firm will monetize their participation (investment). For example:

- Leasing a private CNG refueling station for a fleet, collateralized by a minimum fuel use contract defines the floor for fuel use. The income stream can be defined when it is a fixed fuel price contract, or indexed fuel price contract, or if the fuel price is hedged. With the proper due diligence this can be a low, to moderately risky venture, which can attract low-cost capital, incentivize investors, and may offer for opportunities to participate in other ways.
- Owning and operating a public CNG refueling station does not provide a predicable income without a contracted anchor customer. This will make it difficult to raise funds and capital, which will likely demand a higher return, and result in higher pump prices.

Clearly, the project will influence the financing and the ownership relationship, as addressed below.

How should the project be financed?

Financing may be the most influential, important, and revealing strategy of the commercial model. It is influential because it can make or break the venture; important because it is helps to define the return; and telling because it reflects the level of perceived risk. The key financing options are listed in Table 6. Depending on the project, the risk level of NGV investments vary widely, but all require some level of equity capital, and most are structured from multiple financial instruments.

- **A low risk project** can have a high debt to equity ratio, such as 80/20, or a D/E of 4. This would form a simple structure where the investor can receive a low-interest loan and be able to leverage the return, and consequently charge a lower pump price.

Example 2: Vehicle Leasing

An independent CNG fueling equipment supplier identified a fleet with operating characteristics that are very amenable to the use on CNG. However, the fleet operator was not sufficiently familiar with CNG and lacked the capital to make the large investment to convert the vehicles in large-enough numbers to justify the construction of the fueling infrastructure. The equipment company astutely observed that the first issue is to build confidence for the fleet operator.

The fueling company developed a strategy that would address the firm's financial shortcomings and build the needed confidence to convert to CNG. It reached an agreement with the fleet operator to lease CNG vehicles, and run them all times on CNG. The fueling company would cover the CNG component of the lease, and the difference between the cost of diesel and CNG. As compensation for using the fuel, the fleet operator receives 10% off the would-be average monthly diesel cost. This allows the fueling company to receive the full spread between the fuels to cover their part of the lease, fueling infrastructure and share the profit with the fleet.

.

- **A medium risk project** will demand a lower debt to equity ratio, such as 50/50, or a D/E of 1. Under these circumstances, the debt will command a higher interest or dividend. This structure causes two important impacts: it makes it more difficult to raise equity, and the equity investors will demand a higher return. The debt-side has similar consequences, and jointly, the equity- and debt-side of the structure reduce the leverage and increases the cost of money, which lowers the rate of return on the project. Consequently, and as a compensatory measure, the price at the pump will be higher than for low risk projects.
- **A high risk project** may be able to have the same D/E as a medium risk project, but it will likely require some form of risk mitigating measures, such as loan securitization or loan guarantees. In addition, or alternatively, it may require the participation of venture capitalists, who generally take a disproportionally high equity position for the same equity contribution (e.g., for 10% of the funds, they may want to receive 20% of the equity ownership). This type of structure intensifies the dilution, cost, profit, and pump price effects described above. It is not uncommon for such high-risk projects to dissolve before or shortly after implementation.

A variety of other tools that are often used in NGV projects including grants, emission credits, vehicle incentives, tax credits, accelerated depreciation, etc. Each of these can have an important role in making a project work and should be sought out in any financing strategy.

What should be the ownership structure?

For both refueling infrastructure and NGV projects, the commercial affiliate may be an equity owner, debt financier, general or limited partner, venture capitalist or may be a franchisee (e.g., a representative of a packaged refueling module) or franchisor (e.g., selling a branded home vehicle refueling devices through franchised outlets). The discussion above described the role of the owner, how an ownership position can arise,

Example 3: The Packaged Refueling Module

An LDC affiliate has extensive experience in the gas distribution systems and compression equipment, and it determined to utilize its expertise in the NGV business. The firm's goals were set to include: fast growth, a national reach, and a ROR above 15%. It determined that their investment of choice is in CNG refueling infrastructure.

After further evaluation it determined that the types of projects it can compete successfully are those that utilize pre-packaged refueling modules. It further determined that starting such a business would take too long and too much capital. The firm found an opportunity to become a regional distributor of an imported, reputable, modular CNG system, which was ready for the US market. The franchise fee represented only a small fraction of the firm's intended capital expenditures.

As a franchisee, the firm noticed that it has the option of participating in the refueling infrastructure business in different ownership roles. Entrance into shared ownership roles helped with the sale of the equipment and build a steady stream of income by collecting rent as a limited partner; profits as a general partner; and interest and dividends as a debt financier.

The firm is now evaluating the purchase of their own equipment to rent to a fleet through the use of a minimum quantity fuel purchase contract. While the firm did not achieve national reach, it has exceeded its planned ROR.

.

and the impact it has on a project. The relevance of the ownership role is illustrated in the sidebar for Example 2.

What developmental functions should the firm perform?

A commercial affiliate should consider its function or activities in both developmental and operational stages of each project. These roles will be determined in part by the needs of the client organization and by firm's capabilities, interests, and the ability to increase their return. Capabilities should be carefully considered in designating functions, with recognition that partnering in the development stage can sometimes better ensure that these needed functions are performed well, on time and within budget.

During the developmental stages of refueling infrastructure projects, examples of needed functions include planning, site selection and preparation, engineering, construction and construction management, testing, and in many cases financing. For NGV project, examples of needed functions during the developmental stage include fleet management, vehicle purchasing or conversion of vehicle, refurbishment of facilities to meet safety standards for natural gas use, and inspection of vehicle fuel systems and facilities.

What project activities should the firm engage in?

After development, the project may require operational and other support, which may be delivered during an initialization period, or continue throughout the project. If these capabilities are not part of the project team, they may be contracted from firms that specialize in these services. These activities can include fueling operations, maintenance of the refueling equipment and associated infrastructure (lights, safety systems, perimeter protection, electrical, etc.), management or provision of technical support, training and consulting, arrangements for gas supply, provision of fuel price hedging services, etc. A similar set of services may be provided on the vehicle side of the project.

Appendix A
NGV Market Analyses

Natural Gas as a Transportation Fuel

Business Models for Mainstreaming

Mid-Project Presentation -- Final

Prepared for the American Gas Foundation
By SAIC

April 18, 2012

Table of Contents

1. Project Objectives

Primary Objective

To identify business models that could be used to help establish NG as a sustainable, mainstream transportation fuel.

2. Tasks and Status

- Update, Current Status, Regulatory Review (Tasks 1, 2, and 3)
  - *Status of industry, current practices, incentives*
  - *Effectiveness of recent and existing business models*
  - *Identify issues to define drivers and impediments*
  - *Future legislative/ regulatory landscape*

Statistical aspects summarized in next slides

- Model Development
  Define candidate models

Based on industry interviews (summary later in this presentation)

- Model Evaluation and Implementation Requirements

Next phase of this project

3. Market Data Source

Primary Data Source for NG Vehicle and Fuel Sales

- DOE EIA annual survey of AFVs:
  - *Any organization supplying AFVs for use in U.S.*
  - *Selected organizations using AFVs in the U.S.*
- Includes data on vehicles numbers, fuel consumption, weight class, vehicle type (body configuration), and fuel configuration (dedicated or bifuel)
- Reported annually in "Alternatives to Transportation Fuels" (EIA, ATF)
  - *Most recent publication for 2009 data (EIA ATF 2009)*

3. Market Status Overview

- Greatest numbers of NGVs are LDVs
- NGVs have greatest penetration in the transit market (HDV)
- 2005 to 2009 – NGV # decreased by 3%, NGV fuel use increased 18%
  - Lower fuel consumption vehicles exited market
  - Higher fuel consumption vehicles entered market

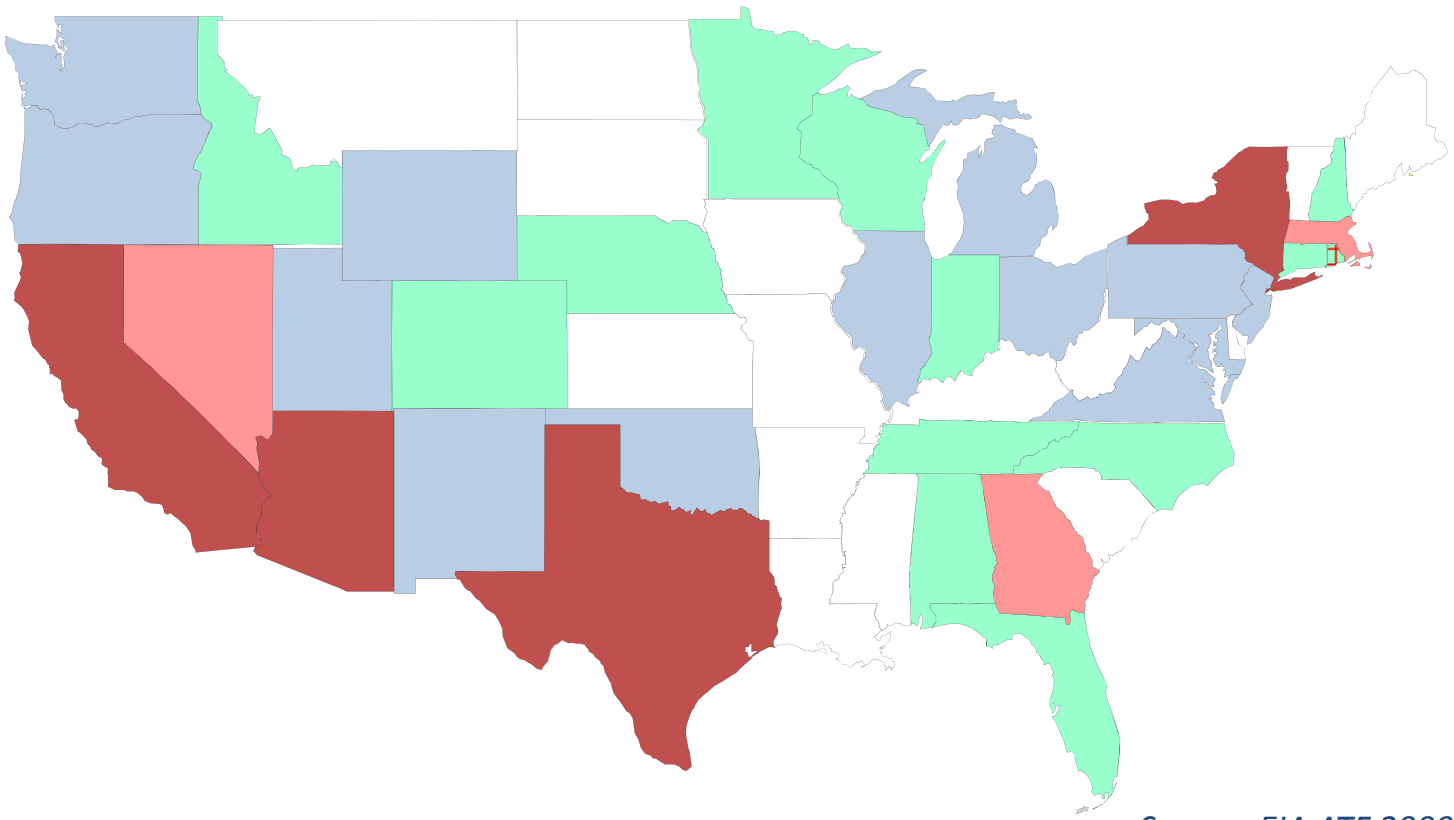
Does not reflect recent growth due to recent expanded fuel price differentials

3. Market -- Annual GGE Sales By State

CNG LNG

Thousand GGE of Natural Gas (2009)

- >15,000
- 5,000 to 10,000
- 1,000 to 5,000
- 100 to 1,000
- <100



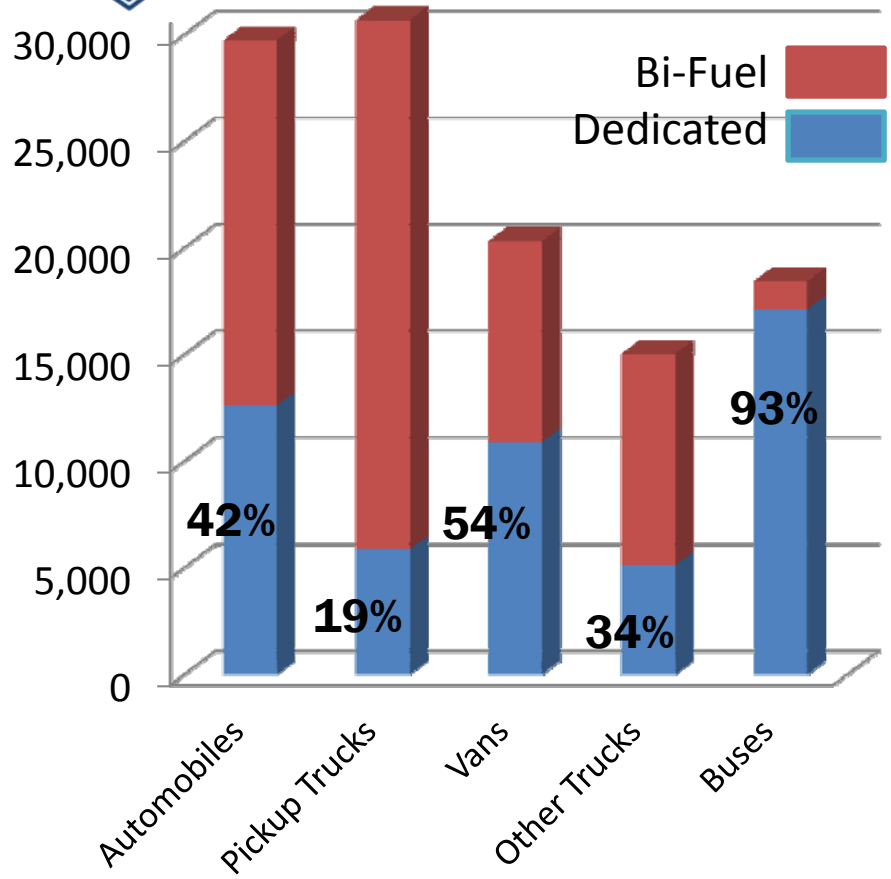
Top States

CA
NY
TX
AZ
GA
DC
MA

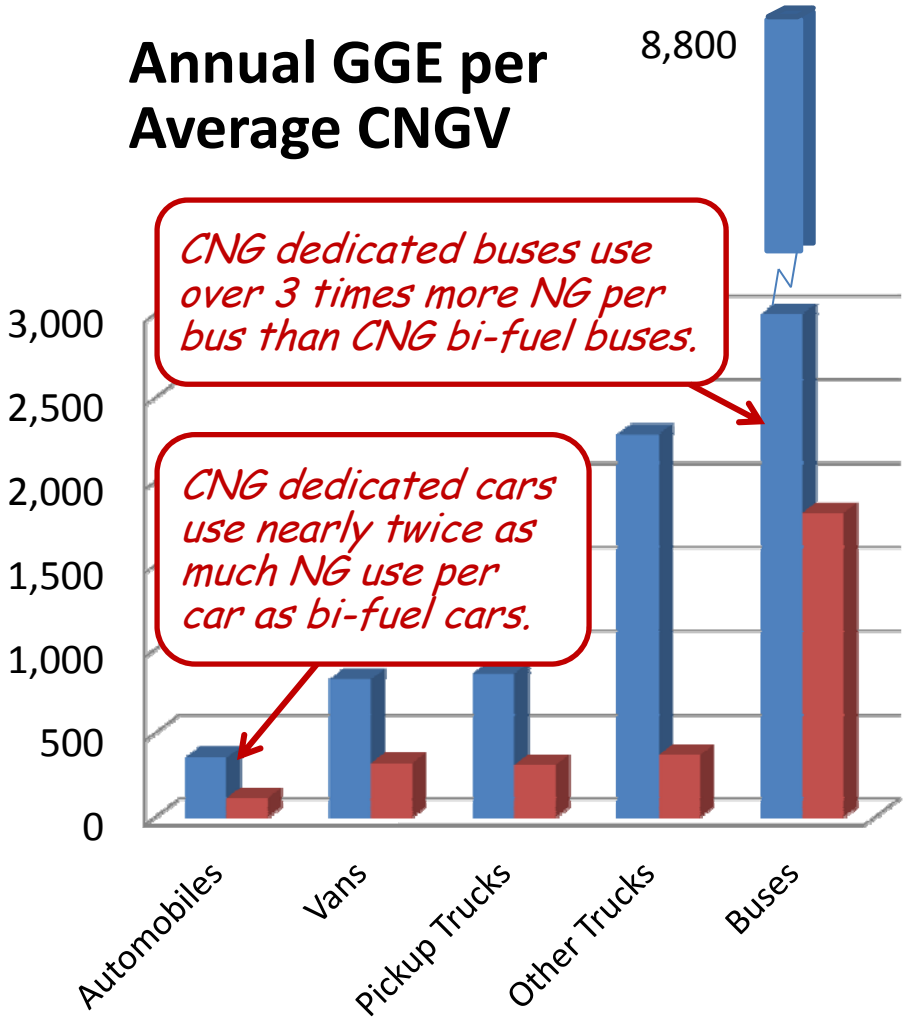
Source: EIA ATF 2009

3. Market – CNG Use by System Configuration

Number of Vehicles



Annual GGE per Average CNGV

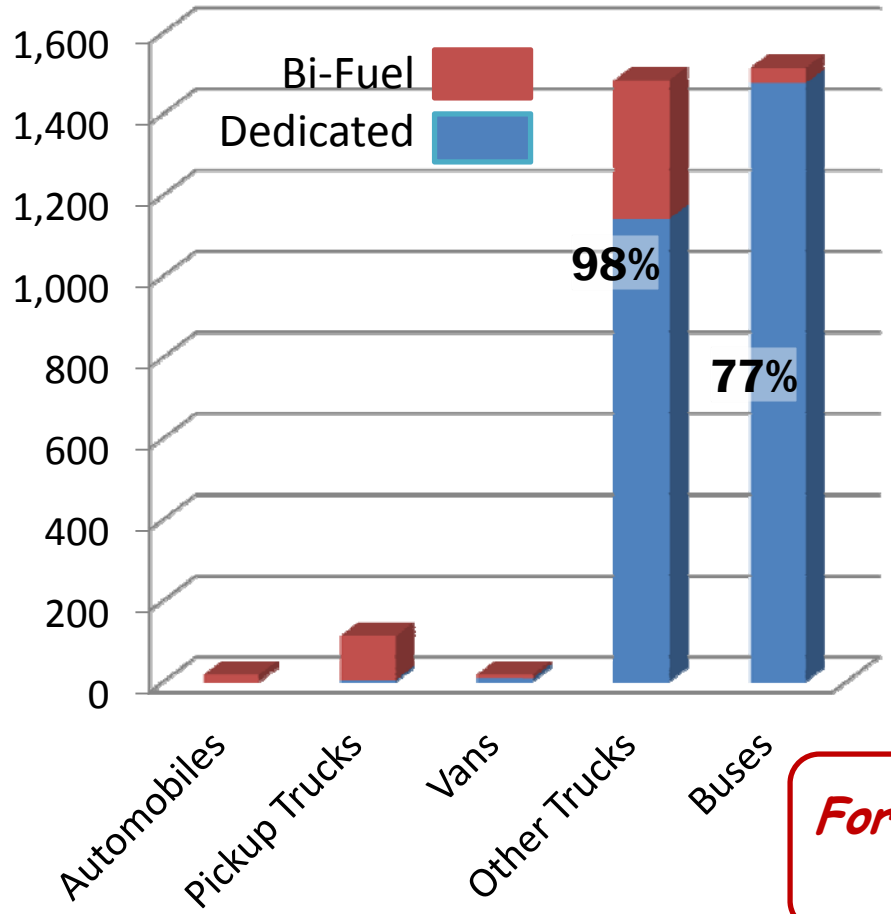


Generally, dedicated vehicles use more than twice as much NG as bifuel

Source: EIA ATF 2009

3. Market– LNG Use by System Configuration

Number of Vehicles



Annual DGE per Average LNGV

Less than 200 combined LNG cars, PU's, and vans

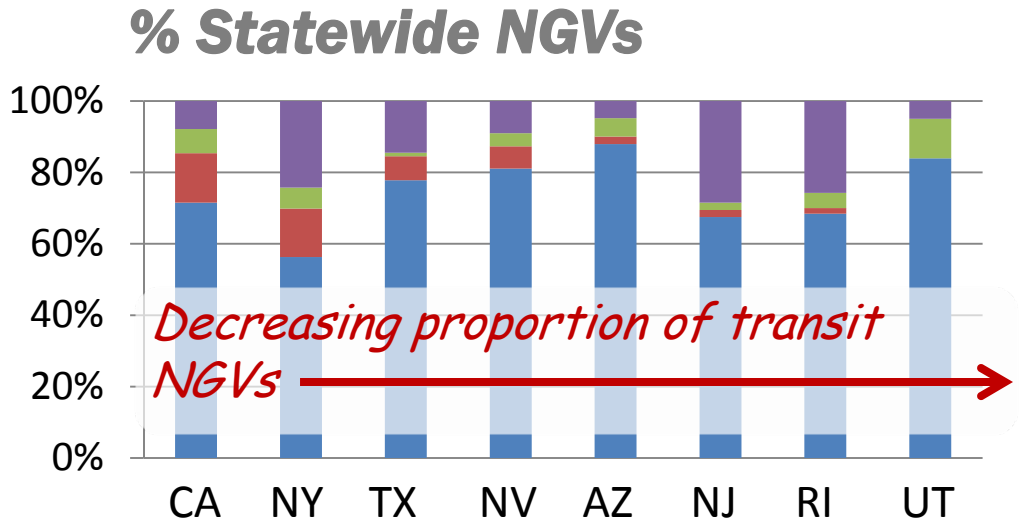
(not enough for confident fuel use stats by configuration)

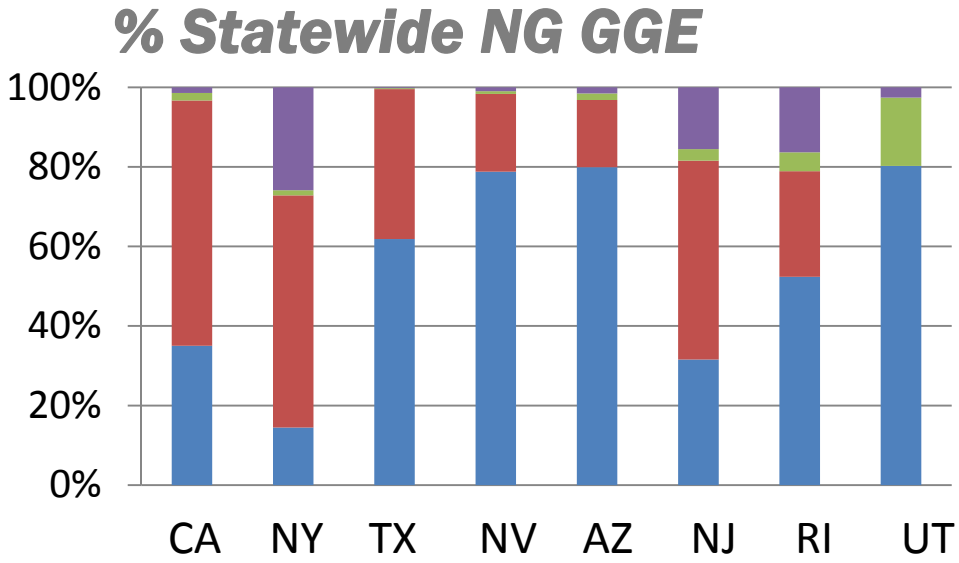
- LNG bi-fuel buses are too few for confident fuel use stats.
- LNG bi-fuel "other trucks" use about 20% more LNG per truck than dedicated LNG trucks.

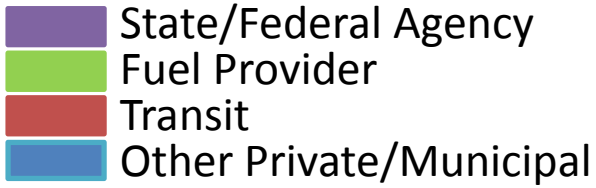
For LNG use, bi-fuel trucks may be similar to dedicated (not true for buses)

Source: EIA ATF 2009

3. Market – Owner Categories in Top States







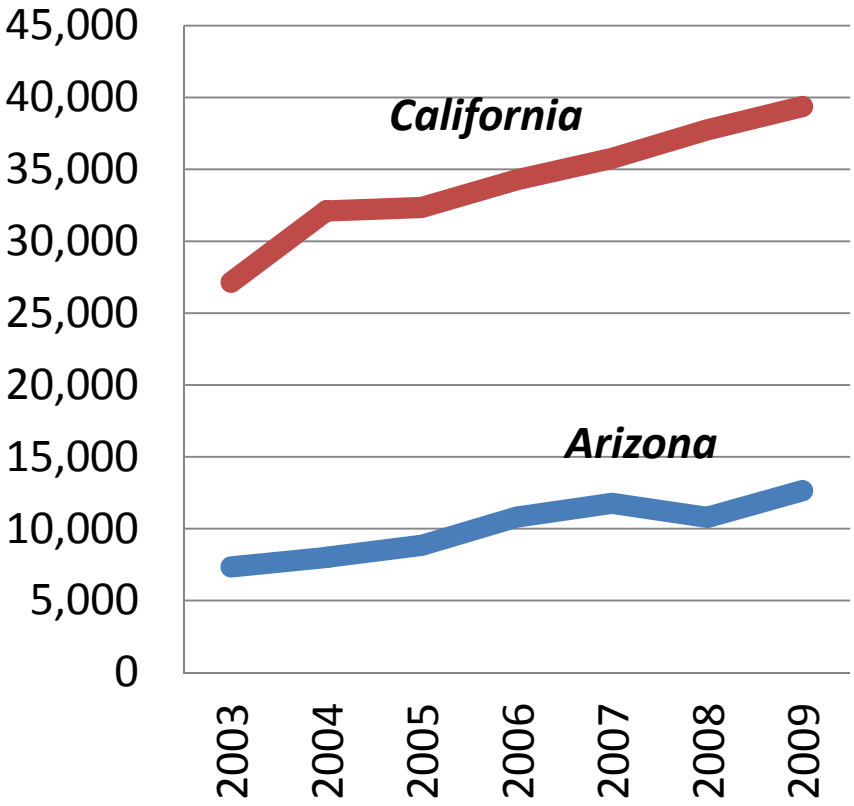
- *Transit uses more fuel per vehicle than other owner types*
- *Fuel use per transit bus may be lower in more rural states*
- *Clean Cities Program promotes transit NGV in larger cities.*

Source: EIA ATF 2009

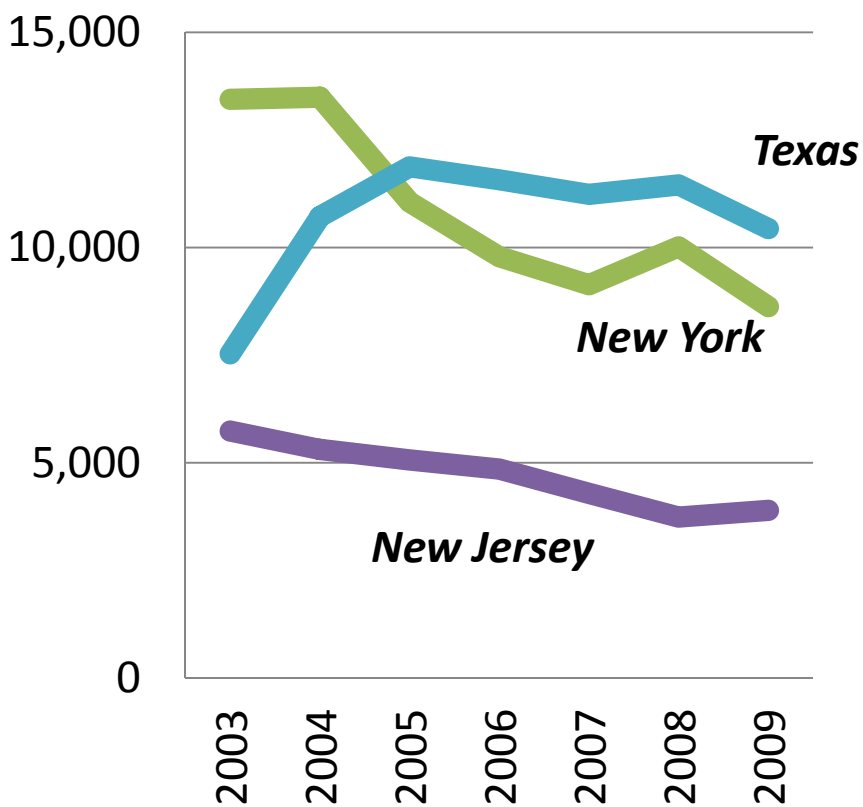
3. Market -- Trends in Top Statewide Fleets

Number of NGV s, 2003 to 2009

Current Largest Two Fleets



Next Three Largest Fleets



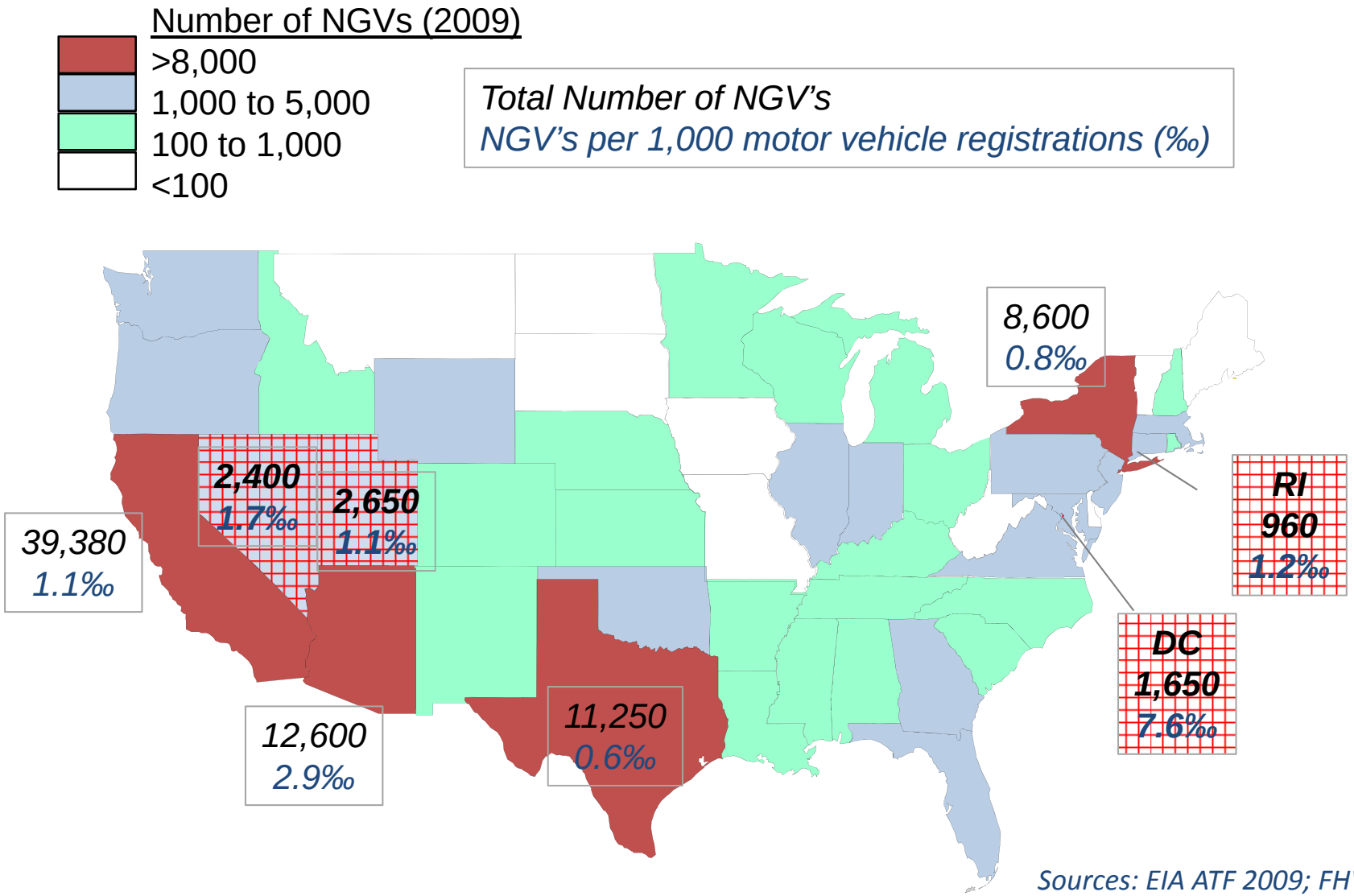
Source: EIA ATF 2003 -- 2009

3. Market -- Penetration Assessment

- FHWA collects data on vehicle registrations by vehicle type and State *(FHWA 2009)*.
- Market penetration of NGVs indicated by the ratio of NGVs to registered vehicles
- Examination of NGV penetration and incentives by state can indicate combination of incentives that have yielded greatest market penetration

3. Market – NGV Penetration by State

CNG LNG



Sources: EIA ATF 2009; FHWA 2009

3. Market -- Incentives Assessment

- DOE's Alternative Fuel and Advanced Vehicle Data Center (AFDC)
  - Collects AFV-related information on:
    - State incentives (i.e., grants, rebates, tax deductions and exemptions, HOV exemptions, etc.)
    - State mandates
    - Utility and private incentives
    - Laws and regulations
  - Continual updates
- State-by-state review of AFDC conducted in March 2012 *(AFDC 2012).*
  - Assessment of previous-year incentives was beyond the scope of this study, thus confident relationships between market penetration and incentives could not be determined.

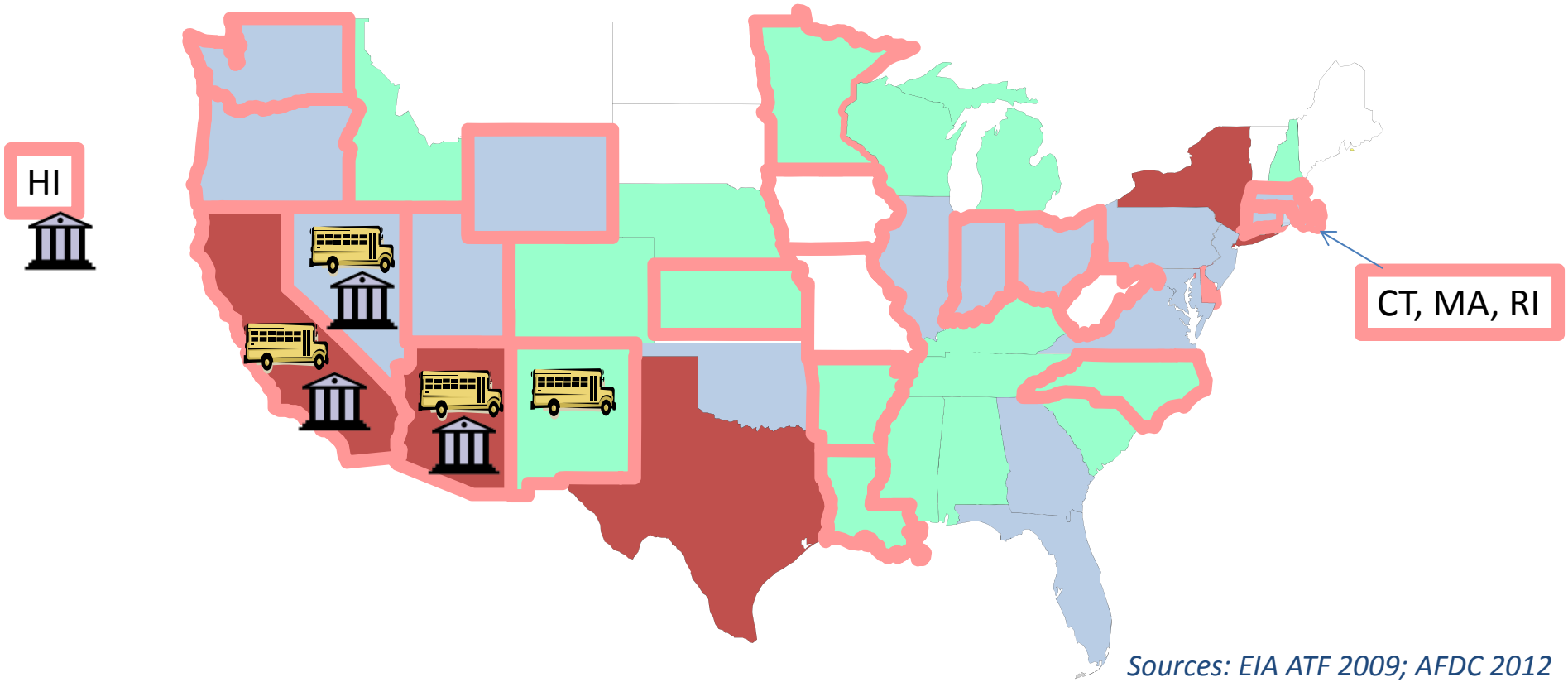
3. Market -- State Mandates

Number of NGVs (2009)
>10,000
1,000 to 4,000
100 to 1,000
<100

23 State mandates for AFVs or clean fuels in state government fleets

4 states have mandates for school fleets

4 states have mandates for county/municipal government fleets



Sources: EIA ATF 2009; AFDC 2012

3. Market -- Utility Rates

State	NGV Rate-Related Regulations
California	Varied discounted refueling rates for specified groups (e.g., home refuelers, etc.)
Utah	PSC allows NGV fuel rates that are less than full cost of service with the remaining costs spread to other customers
Georgia	Allows cost of service fee for CNG fuel
Texas	Assures "competitively priced" NGV fuel for schools and local public entities
Kentucky Louisiana Mississippi Massachusetts	NGV fuel sales are not regulated *(MA further states that NGV refueling investments cannot increase NG costs for non-motor fuel applications)*

Source: AFDC 2012

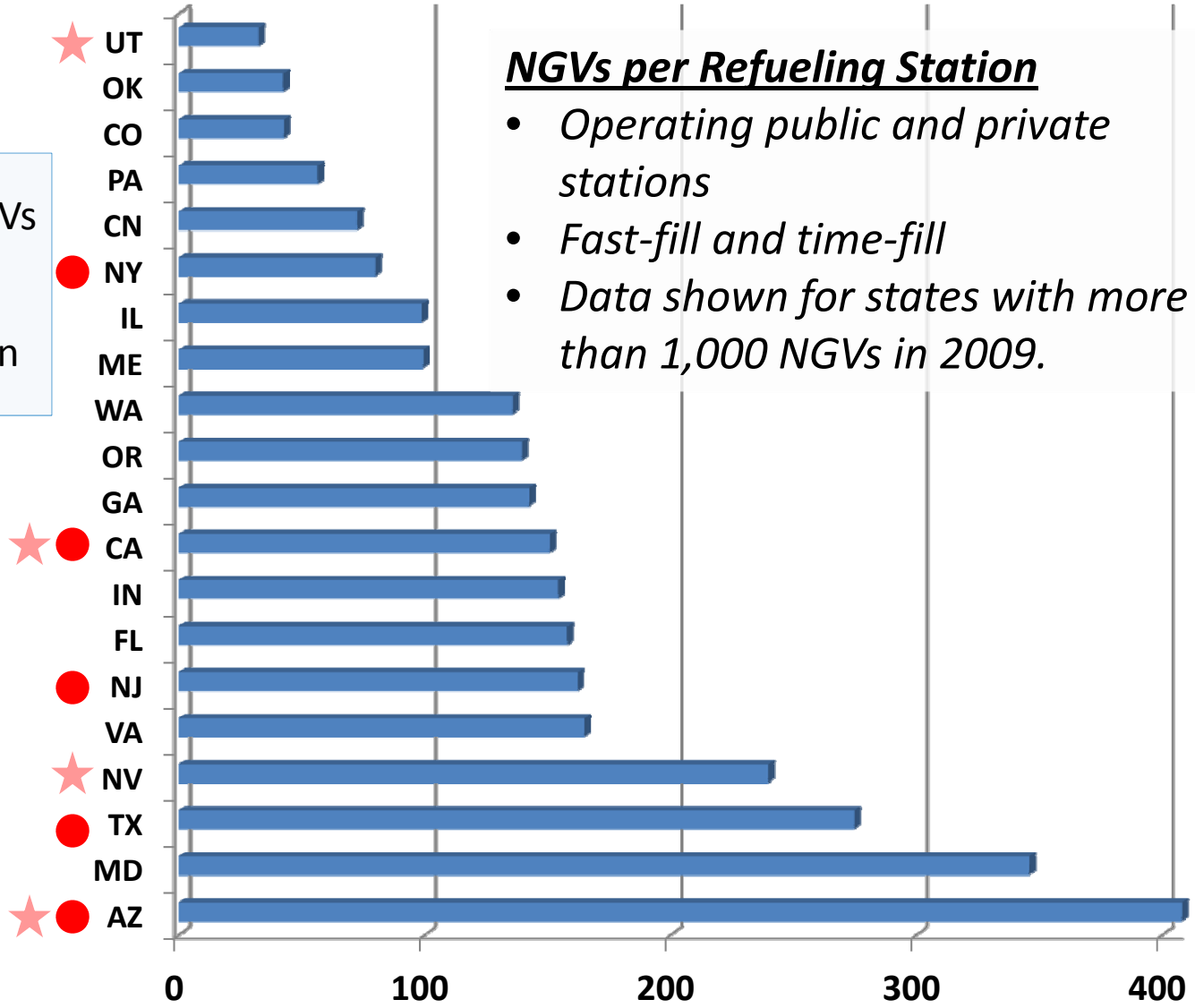
3. Market -- Refueling Station Assessment

- DOE's Alternative Fuel and Advanced Vehicle Data Center (AFDC)
  - Refueling station list by state
    - Public and private stations
    - Distinguishes fast-fill and time-fill
    - Operational and planned
  - Continual updates
  - Reviewed in March 2012 *(AFDC 2012)*

3. Market -- Number of NGVs per Station

● Top 5 State for NGVs

★ Top 5 State for market penetration



NGVs per Refueling Station

- *Operating public and private stations*
- *Fast-fill and time-fill*
- *Data shown for states with more than 1,000 NGVs in 2009.*

Sources: EIA ATF 2009; AFDC 2012

4. Business Model

- **Business models considered focus on LDC applications**
  - Fuels supply, fuel infrastructure, Fuel-related services, etc.
- **Models presented below reflect:**
  - Preliminary Observations – based on 15 interviews and literature

4. Business Model -- Interviews

Completed		Planned
1. AGL Resources	9. New Jersey Nat. Gas	1. Sempra
2. Canadian NGV Assoc.	10. NiSource	2. Pioneer
3. CenterPoint	11. Piedmont NG	3. Clean Energy
4. Chesapeake	12. PSE&G	4. Mountaineer Gas
5. DTE Energy	13. TECO Energy	5. Questar
6. EnCana	14. UIL (So Conn Gas)	6. MDU Utilities
7. Integrys	15. Washington Gas	7. Other, TBD
8. National Fuel		

4. Business Model -- General Categorization

1. Commercial Models
2. Rate-based Models
3. Non-Rate-based Models
4. Hybrid Models

4. Business Model -- Commercial

General Characteristics of Commercial Models

- **Used by Commercial Firms** (including unregulated subsidiaries of utilities and utility holding companies)
- **General Profile -** Competitive, unregulated, profit oriented, preference for non-rate-based areas, target economically viable projects and risk minimization
- **Investment** - based on common commercial requirements (ROI, Payback, Risk/return, Market Expansion, etc.)
- **Markets -** Targeted marketing to large fleets with high fuel usage (trucking, transit), do not rely on incentives

4. Business Model -- Commercial

Key Activities In Commercial Models

- Contract to build fueling stations (with or without operation or maintenance agreements)
- Fueling capacity for fixed fee
- Fuel under tariff with guaranteed minimum fuel usage
- Other considerations

- **Examples:** *Integrys, TECO, Gaz Métro*
- **Commercial Matrix Model –** at least one organization, *Clean Energy Fuels,* uses a matrix model (vertical and horizontal integration) across products and services, and for multiple fuels

4. Business Model – Rate-Based

Rate-based Models

- Some or all NGV-related activities are allowed in the utility rate structure.

Example Activities in Rate-based Models

- Build-out of refueling infrastructure
- Provide infrastructure-related services (e.g., compression or dispensing equipment O&M)
- Marketing and educational activities
- Financing of NG supply and vehicle-related investments
- Application of favorable NG for transportation rates, etc.

4. Business Model – Rate-Based

Example LDCs

- **Atlanta Gas Light (AGL)** - uses a Universal Service Fund as seed for funding CNG infrastructure. Service charges will be recycled into additional NG projects for transportation.
- **Southern California Gas** - plans to provide compressed NG to fleets and recoup the cost through the use of approved compression rates.
- **Southern Connecticut Gas, Connecticut Natural Gas, and Yankee Gas** use a 2006 regulatory decision to promote the use of NG in transportation through the use of a rate adjustment mechanism called "developmental rates". Allows near-feasible commercial NG projects a rate that makes the investment feasible.
- **National Fuels Gas Distr. (NY)**– has PUC approval to defray the cost of NGVs and fueling infrastructure. The return to the ratepayers is guaranteed by fuel purchase contracts, backed by a letter of credit, with a payback of no longer than 6 years

4. Business Model – Rate-Based

Some Characteristics of Rate-based Models

- **Used by LDCs to:** increase throughput and revenue, stimulate market, help attain environmental goals, meet State or PUC goals, improve seasonal load balance, assist in meeting national energy goals, etc.
- **LDC General Profile -** operate in rate-based service area, looking for viable opportunities to obtain a just return to the ratepayers, acts to minimize risk to the ratepayers through prudent agreements and by shifting all or the bulk of the risk to the NG user/client
- **Investment** – generally, based on common commercial requirements (ROI, payback, etc.) manage risk but return is not risk-adjusted, support market expansion for NG, etc.
- **Market Segments** – active, and often targeted, marketing to large fleets with high fuel usage (trucking, transit, municipal fleets), but encourage public access and support small users.

4. Business Model – Non-Rate-Based

Non-Rate-based Models

- Where LDCs cannot rate-base specific NGV-related activities, but can engage in some activities that directly or indirectly support NGV development (allowed activities vary).

Example Activities in Non-Rate-based Models

- General marketing and information activities which may include NGV-related information
- Respond to inquiries from potential NGV users
- Convert utility fleet to NG for cost saving and marketing
- Use grant funds issued specifically for increasing NGV use, for improving the environment, etc.
- Engage in NGV-related activities that are accounted for as “unallowable” and charged against the profits

4. Business Model – Non-Rate-Based

Some Characteristics of Non-Rate-based Models

- **Used by LDCs to:** explore the NGV market, build a case for the PUC to rate-base NG for transportation, encourage third party investment to increase throughput and revenues, help attain environmental goals, improve seasonal load balance, assist with national energy goals, etc.
- **LDC General Profile** – Growth-oriented utilities looking to open new markets and grow their business, looking for viable opportunities, seek to minimize risk, use it as a fuel diversification strategy, etc. May look for, and benefit from, teaming with commercial partners.
- **Investment** - based on the exploratory and developmental theme, proof of business concept, for ultimate throughput expansion, etc.
- **Markets –** May or may not include active marketing. If active marketing is conducted, targets large fleets with high fuel usage (trucking, transit).

4. Business Model – Non-Rate-Based

Example LDCs

- **Washington Gas Co –** exploring the re-establishment of the NGV business. Engages in exploratory activities and support to interested parties. Considering partial utility fleet conversion.
- **CenterPoint Energy --** a holding company, exploring the opportunities for each of their utilities in 5 states.
- **Others**

4. Business Model – Hybrid

Hybrid Models – incorporate features of at least two of the above models.

- Some LDCs are using or considering use of hybrid models at LDC and holding company levels
- Examples incorporate varied features
- Analysis of hybrid models will be conducted in the next phase of this project

4. Business Model -- Emerging Themes

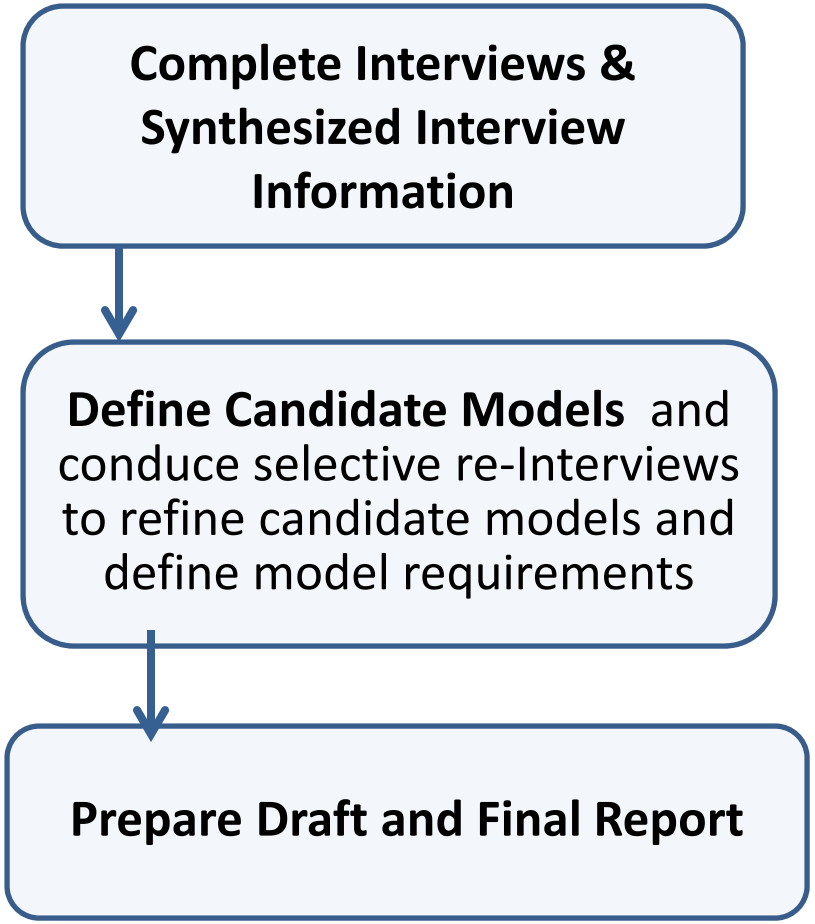
The Emerging Themes to Date are Summarized Below:

- *Rate-based investment use business criteria to assure returns to the ratepayers.*
- *Commercial investment may elect to seek risk-adjusted returns.*
- *Models consider past NGV experience and are designed to manage and prepare the LDC and customer to survive risks, e.g.,*
  - ***Customer risks*** *(e.g., use due diligence and solid contracts)*
  - ***Fuel price spread risk*** *(e.g., consider hedging)*
  - ***Technology risks*** *– availability, system reliability, supplier dependability, performance, training, etc., are part of many models.*
  - ***Event risk*** *– major vehicle or fueling incident, hurricanes, distribution constraints, suspension of incentives, etc., are themes found in discussions.*

4. Business Model -- Emerging Themes

- *All models use targeted, informed marketing to pick best customers early*
- *Non-Rate-based LDC model may be effective to launch the NGV business. However, it is limited in what it can accomplish, and has a limited amount of time and resources to be effective in a competitive environment*
- *There is caution to use incentives wisely, and avoid becoming incentive-dependent*
- *In the long-term, all parts of the NG for transportation business will need to be commercially viable, on it's own merits*

5. Next Steps


Complete Interviews & Synthesized Interview Information
Define Candidate Models and conduce selective re-Interviews to refine candidate models and define model requirements
Prepare Draft and Final Report

Appendix B
List of Interviewed Organizations

Organizations interviewed between March and June, 2012.

1. AGL Resources
2. Apache
3. Canadian NGV Assoc.
4. CenterPoint
5. Chesapeake
6. Clean Energy
7. DTE Energy
8. EnCana
9. FortisBC
10. Integrys
11. Los Angeles County MTA
12. National Fuel
13. New Jersey Nat. Gas
14. NiSource
15. Orange County Transit
16. Piedmont NG
17. PSE&G
18. Questar
19. TECO Energy
20. Trillium
21. UIL (So Conn Gas)
22. Washington Gas