

Natural Gas Vehicle Incentive Program

January 15, 2009

Report Prepared For:



Natural Gas Vehicles for America

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Natural Gas Vehicle Incentive Program

Introduction

Emission reductions of toxic air contaminants and greenhouse gases from the transportation sector are achievable by replacing older diesel trucks with new, clean burning natural gas vehicles. Because of energy security issues, cost savings and environmental benefits, communities across the Northeast and Mid-Atlantic regions have expressed significant interest in the deployment of new heavy duty vehicles powered by natural gas, including refuse, port and delivery applications. NGV America engaged Emisstar LLC to develop a streamlined and efficient natural gas vehicle incentive program to promote and accelerate the replacement of older diesel trucks with new natural gas vehicles.

Emisstar LLC is a consulting practice focused on the scientific, technology, business, policy and public health issues surrounding mobile air emissions. The company was formed in 2005 to assist private and public sector clientele with understanding air quality issues and to create effective responses. With a growing public awareness of the impact of mobile source emissions, Emisstar is uniquely positioned to develop cost-effective strategies that provide emission reductions, improve air quality, and address private and public sector needs and concerns.

Background

This incentive program design is based on prior diesel emissions reduction program research and development work performed for the New York Metropolitan Transportation Council (NYMTC), the regional council of governments responsible for planning and making decisions about how federal, state, local and other funds are spent on regional transportation infrastructure. NYMTC is the designated metropolitan planning organization (MPO) for the New York portion of the air quality non-attainment area and is responsible for meeting Clean Air Act transportation conformity requirements.

As part of a regional strategy and shared vision to reduce harmful Ozone (O₃) and Particulate Matter (PM) emission levels in and around the New York City Metropolitan Area and to address future transportation conformity requirements, NYMTC commissioned detailed assessments of emission reduction measures and contracted the team of Sarah J. Siwek & Associates (“SS&A”) and Emisstar to develop a framework for a supplemental emission reduction program.

With NGVA support, Emisstar leveraged the insights and opportunities presented by the NYMTC Implementation Project to create a simplified framework for establishing a

CNG vehicle incentive program in the NYMTC region and the Northeast and Mid-Atlantic regions.

Methodology

To develop this incentive program framework, interviews were conducted with key entities, and relevant existing programs across the nation were analyzed.

- 1) Interviewed Key Entities - Emisstar conducted thorough interviews with regional environmental quality agencies and government organizations to gain an understanding of existing programs, successes and weaknesses, program criteria, and funding sources and availability. Emisstar interviewed private sector entities, including providers of CNG fueling infrastructure, utilities, associations, and truck manufacturers as a means of ascertaining government and private sector requirements for an effective streamlined incentive program. Entities interviewed include the following:

Government Organizations

- a. New York State Energy Research and Development Agency (NYSERDA)
- b. New York City Department of Transportation
- c. New York City Department of City Planning
- d. Hunt's Point Economic Development Commission
- e. Port Authority of New York New Jersey
- f. New York State Department of Environmental Conservation
- g. Metropolitan Transit Authority
- h. PLANYC 2030 Committee
- i. New York State Department of Transportation
- j. New York Power Authority
- k. NYMTC
- l. New York City Economic Development Corporation
- m. Nassau County
- n. Suffolk County
- o. Westchester County
- p. Rockland County
- q. Putnam County
- r. New York City Mayor's Office
- s. I-95 Coalition
- t. Greater Long Island Clean Cities
- u. New York and Lower Hudson Valley Clean Cities
- v. Northeast Diesel Collaborative – EPA Regions 1, 2 and NESCAUM

Private Sector / Industry

- a. Nationalgrid (formerly Keyspan)
- b. Clean Energy

- e. Cummins / Westport Innovations
 - f. Hallahan Truck Sales
 - g. Solid Waste Association of North America
 - h. Selected end-users
 - j. Capacity of Texas, Inc.
- 2) Comparative Programs Review – Reviewed and extracted information from successful programs from other regions, such as the Texas Emissions Reduction Plan (TERP), and the Gateway Cities and Carl Moyer programs in California, in order to incorporate the best aspects of these programs into the proposed CNG vehicle incentive program framework.
 - 3) Developed CNG Program Recommendations –
 - a) Developed proposed program administration structure.
 - b) Devised emissions and other benefits calculations.
 - c) Identified program criteria such as vehicle eligibility, the role of dealers and distributors and scrapping requirements and methods.

Incentive Program Comparisons

A number of voluntary diesel emissions reductions incentive programs exist throughout the country, developed primarily as an alternative to mandated requirements to reduce emissions of particulate matter (PM) and oxides of nitrogen (NOx). The incentive program researched includes the following:

- Carl Moyer (fleet modernization and retrofit programs) - California
- Sacramento Emergency Clean Air Transportation Program (SECAT) - California
- Gateway Cities (pilot and Ports of Los Angeles/Long Beach programs) - California
- San Pedro Bay Ports Clean Air Action Plan - California
- Texas Emissions Reduction Plan (TERP, rebate and Emissions Reduction Incentive Grant programs) – Texas
- Texas General Land Office Natural Gas Vehicle Incentive Program
- New York State Energy Research and Development Authority Alternative Fuel Vehicle Programs

Collectively, these programs have successfully “cleaned up” thousands of engines at a cost nearing a billion dollars. California’s Carl Moyer program was developed in 1998 and has been the example program for several other large-scale, comprehensive incentive programs, including the Texas Emissions Reduction Plan. Others, such as the Gateway Cities programs, were developed specifically to address emissions from a single sector (e.g., ports) in a particular geographic area. Many of these programs have a broad focus

and are open to a wide variety of fuels, sectors (e.g., nonroad, agriculture) and project types (e.g., new purchase, repower).

Each program was developed with specific goals in mind (e.g., reduction of NO_x or PM) using certain funding mechanisms (e.g., federal or state sources), but many of the programs have common elements demonstrating program approaches that have been successful, for both program administration and participants. Other issues, such as avoiding paying for attrition, are approached differently by various programs. Highlighted below are several considerations worth noting for these incentive programs:

a) Predictable Funding Opportunities

Businesses prefer predictable environments and generally need lead time to evaluate their fleets and plan new purchases. Government organizations also need the ability to plan purchases around their budgeting and procurement cycles. Programs with steady sources of funding that are able to open grant rounds at fairly regular intervals will be most useful to applicants. For example, both Carl Moyer and TERP have been authorized to continue through 2014 and 2013, respectively, funded through specific state or regional fees and taxes.

The ideal scenario is for a program to be supported by an ongoing revenue stream so that program continuity, applicant participation and emissions reductions can be maintained. For example, the TERP program is funded by a combination of fees on the sale of diesel equipment and trucks and on vehicle title transfers. When the economy is strong and sales and transfers are up, increased revenue flows into the program account. Since not all revenue is appropriated every year, savings are created. When the economy is down, the TERP program contributes to an economic ‘safety net’ by channeling hundreds of millions of dollars into the purchases of cleaner trucks and equipment. The ultimate goal for program funding that is the most attractive for applicants is an ‘evergreen’ program that is open year round.

b) Speed of Program Turnaround

A nearly universal concern expressed by grant program participants is the length of time required to receive reimbursement or grant approval. A lengthy program turn-around time can negatively impact small and large businesses and government entities. Businesses are impacted because they must either be out-of-pocket a large sum or arrange for special financing terms if reimbursement takes longer than about 30 days. Dealerships are negatively impacted if they accept grant funds as down payments, and then must wait for an extended period to be reimbursed. Similarly, the cash flow of government entities is impacted if they must consume a significant amount of their budget and wait a long time for reimbursement.

While the Gateway Cities and SECAT programs were outright grant programs and had a very short turn-around time of two to four weeks once an application was approved, the TERP Emissions Reduction Incentive Grants can take up to nine months from application to reimbursement. That lengthy time-to-reimbursement is one reason the TERP Rebate Program was created, to provide a much shorter reimbursement time (as little four to six weeks), for eligible applicants. Therefore, grant programs and rebate programs are preferable to reimbursement programs, especially in the current economic climate.

There are several methods to reduce turn-around time, including combining the application and contracting processes into one step, paying funds on a first-come, first-served basis, establishing an on-line application process, and ensuring adequate staff to quickly process applications.

c) Outreach and Education

All of the California programs recognize the key role of truck dealerships to the success of the program, and most of them have actively trained or assigned program personnel to liaison with dealers to promote the programs. In Texas, the TERP program has not had the administrative ability to focus on dealers directly, but has developed materials that dealers can use to promote the program (e.g., brochures, posters), and encourages dealers to participate in public training workshops. By educating and promoting these programs through dealers, who have an obvious incentive to sell their vehicles to customers, programs can leverage additional resources to assist program participants with many of the program components, from application completion to scrappage requirements.

Additionally, other outlets, such as trucking and trade associations, chambers of commerce, business associations, unions, port authorities, consultants and appropriate governmental organizations need to be utilized for outreach where possible. Other channels can include notices sent out with registration renewals and tax notices.

Businesses can be skeptical about perceived “strings that are attached” to new programs and positive input from peers can help overcome concerns. The feedback from other program administrators has been that far greater outreach efforts than were originally anticipated were needed to achieve maximum program participation especially from small businesses and truck owner-operators that tend to be operating the oldest and dirtiest trucks.

Typical outreach activities include informational websites, posters, brochures, and numerous workshops on the grant programs. Both daytime and evening workshops need to be offered at a variety of locations throughout the eligible region, in multiple languages if needed. For the TERP program, administrative staff also presents information at private events that may be sponsored by dealers, or present directly to individual businesses, non-profits, or government agencies, when requested.

Administrative overhead for program management, including outreach activities, ranges from 1.5% to 15% of the program funding.

d) Paying for Attrition

The task of developing a program that avoids paying for normal attrition is a challenge. Most of the California programs (SECAT, Carl Moyer, Gateway Cities) approach this issue by focusing on replacing only the oldest engine model years (i.e., pre-1990), with the rationale that owners of vehicles in that age category are likely to purchase a used vehicle to replace the old truck, so the program ensures that a cleaner replacement truck would be purchased. There is merit to this approach, provided that a significant population of trucks exists to participate in a program. Particular demographics of a region may differ because of climate factors (e.g., harsh winters may accelerate vehicle degradation due to salt damage), industry (e.g., duty-cycle and mileage differences), as well as other factors.

An alternative approach is to focus on a larger pool of potential applicants and allow the emissions standards to dictate what engine model years should be included, which is what the TERP program has done by calculating grants based upon the actual emissions reductions. For example, the amount of PM emitted from a 2007-compliant engine (0.01 grams per brake-horsepower-hour) is ten times less than from a 2006 engine. The truck population with 2006 and older engines is orders of magnitude larger than a truck population with 1990 and older engines. This newer truck population is also much more likely to continue operating well into the future because of the long useful life of diesel engines, while the older truck population may be nearing the end of its useful life. While the first approach focuses specifically on the “oldest, dirtiest” trucks, the second approach clearly meets the definition of “accelerated fleet modernization” because it aims to retire trucks that probably would have been sold into the secondary market, perhaps multiple times. Both can achieve significant emission reductions and can be viable options for a program. One of the most effective ways to minimize paying for routine attrition, however, is to require a relatively lengthy project life. All of the existing incentive programs require 5 year or longer contractual obligations, so this requirement is an effective participation disincentive for companies with fleets of onroad vehicles with a corporate asset management policy that may be turning over their fleets more quickly. In addition, adding program requirements that prevent the newer grant funded trucks driving more miles than the older trucks they are replacing prevents funding trucks that were “back up” vehicles or likely to be replaced in the near term.

e) Program Commitments

Establishing required but appropriate obligations for applicants is crucial to encouraging participation and earning creditable emissions reductions. Earlier programs have

accomplished this in part through trial and error, the lessons of which can be incorporated into a NYMTC program.

Required usage

In-region or in non-attainment area usage requirements have varied from 25% to 80% of miles traveled. Generally, the lower the usage level, the lower the grant amount, so lower usage levels may yield unattractive grant amounts for funding. A truck owner willing to take a very low grant amount toward the purchase of a new truck may have been planning on eliminating that truck from their fleet anyway, which means that paying for very low usage levels could be simply subsidizing attrition. On the other hand, requiring usage levels in the eligible region of 75% or higher may limit the number of eligible applicants more than desired. With a relatively low initial amount of funding a fleet modernization program is likely to have more applicants than can be funded, so higher usage levels of 75% or more seem appropriate. As the program grows, however, administrators may want to lower usage requirements to increase the number of eligible applicants, or they may want to consider a combination of usage percentages to determine eligibility and to calculate grants separately. For instance, trucks could be required to drive 75% of the time in the state or along certain corridors to be eligible, but only the percentage of time actually driven within a smaller eligible region would be used for calculating the grant amount. It will be important however, to ensure that emission reductions are occurring in the non-attainment area in order for credits to be allowed in transportation conformity.

Penalties

If program commitments are not met, most programs require that a pro-rated portion of the grant be repaid. In the cases of suspected unlawful collection of grant funds, fraud or other illegal actions associated with the grants, applicants may be investigated and prosecuted by applicable legal authority (e.g., the State Attorney General).

Since the programs being proposed are voluntary programs which will only succeed if there is significant participation, it is important that the program be flexible enough to accommodate typical business events such as a sale of the company, mileage fluctuations and extensive vehicle breakdowns. In the past, Gateway Cities required that the truck owner not change the type of goods being hauled, but this requirement proved unnecessary, as the businesses rarely changed vocation. The TERP program reviews extraordinary situations on a case-by-case basis to determine the most appropriate remedy. TERP and Gateway both allow for other parties to assume the program contract responsibilities in the event of the sale of the truck. Mileage fluctuations can be accommodated by allowing a range of mileage to be driven, for example, no more than 130% of previously reported mileage over the past two years. The TERP program sets no

maximum mileage, but requires that trucks be driven at least the previous annual mileage on the application. This is to discourage applicants from deliberately overstating mileage in order to receive a higher grant amount. A combination of maximum and minimum mileage requirements may be the best approach.

It is recommended that program administrators be as flexible as is reasonable while maintaining program integrity and fairness. Being too stringent may earn the program a label of 'being difficult to deal with' and discourage applicants.

f) Administrative Hurdles

After reviewing all of the various incentive programs, it is apparent that they are all fairly complex in terms of the amount of information required by the applicant and the number of processes that comprise each program. To some extent, many of the details are necessary for a program to be able to claim emissions reductions for State Implementation Plan or transportation conformity credit, but some programs, such as the TERP rebate program, have attempted to simplify grant calculations for the applicant by creating set grant amounts based upon default mileage and usage values. Programs in California have encouraged dealer participation to help participants with required inspections (e.g., CHP BIT required for Carl Moyer and Gateway Cities), digital photographs, and other documentation, and they have staff available to help applicants with the process. In Texas, both TERP programs have very low administrative costs (1.5%), and while staff does provide application assistance workshops, the applicant carries the overall burden to learn how to participate in the program. In the most recent TERP grant round, the regional EPA office stepped in to assist TERP grant applicants with emissions calculations and assembling grant documentation. All of these programs require detailed information not only during the application process, but also during the life of the project, through periodic reporting. Recently, inclusion of Global Positioning System (GPS) technology has become a popular addition to most of the programs, which can automatically report usage in terms of mileage and where the mileage occurred to the grant program, making it easier for applicants to demonstrate their fulfillment of their program obligations. From a participant's perspective, simple programs will always be preferable, and the challenge for these voluntary incentive programs is to develop processes that balance program needs (e.g., data required to calculate emissions reductions, verification that applicant owns vehicle) with applicant motivation to participate.

Natural Gas Vehicle Incentive Program Overview

The natural gas truck program is intended to encourage the purchase and expansion of natural gas vehicles (NGV) in the NYMTC region through direct subsidies. Providing subsidies to purchase NGVs will not only reduce particulate matter (PM) emissions but also reduce oxides of nitrogen (NO_x) and carbon dioxide (CO₂) emissions by amounts greater than even the cleanest diesel engine program. Emissions benefits of natural gas engines as compared to EPA compliant 2007 diesel engines include 50% less NO_x emissions, 90% less carbon monoxide and 20-23% less carbon dioxide. Although the cleanest diesel engines are being phased in beginning in 2007, natural gas engines that already meet the EPA 2010 standards are available now. Possibly the greatest benefit for switching to domestically-produced natural gas fuel is strengthening U.S. energy security by reducing dependence on foreign oil sources. Over 97% of natural gas is produced in North America.

In the past decade, several NGV programs have been implemented across the country. However, they were challenged in the early years by first generation engine technology and limited and poorly designed fueling infrastructure. While natural gas vehicles remain cleaner than diesel engines, they are now as or even more reliable than diesel counterparts, can be fast-fueled and provide the additional emissions reduction and energy benefits listed above. Natural gas vehicles, typically fueled by compressed natural gas (CNG) or liquefied natural gas (LNG), have been successfully deployed in a number of applications including: airport shuttle bus fleets; refuse fleets; municipal transit bus fleets; and non-road and on-road support vehicles at marine ports and nearby rail and inter-modal terminals.

Ideal target fleets for a NGV program are those that are centrally-fueled and domiciled or have routes near existing natural gas filling station infrastructure, to meet fueling requirements and to ensure access to either a fleet controlled fueling source or a public natural gas fueling station.

Because of the greater emissions benefits of a natural gas powered truck and an estimated 30% cost premium over comparably-equipped diesel trucks, it is anticipated that the natural gas truck program will need to provide additional subsidies when compared to a diesel-only program. The actual cost differential depends on the type of vehicle replaced. Some vehicles in the target fleets, such as refuse trucks, are significantly more expensive than other trucks in the same class, regardless of fuel-type. Approaches to mitigating the increased cost for natural gas refuse trucks should include, for example, taking into account the Federal Vehicle Purchase Tax Incentive (up to \$32,000 per vehicle) and the fuel cost savings that fleets can expect to achieve.

a) Natural Gas Benefits

Because natural gas vehicles emit fewer criteria pollutants and greenhouse gases as compared to even the cleanest diesel engines currently available, it is important to highlight and account for these additional emissions reduction benefits as the program design is developed. Although these factors may not necessarily be directly used as part of the grant calculation (we use a PM calculation like for the diesel fleet modernization program), they contribute to the justification for a higher cost per ton limit. As noted above, approximate additional emissions reductions from natural gas compared to an EPA compliant 2007 diesel engine include: 20%-23% less CO₂, 90% less carbon monoxide (CO) and 50% less NO_x.¹ Additionally, natural gas powered engines provide another benefit of being quieter than diesel engines, with an 80-90% lower decibel level.²

b) Program Factors Under Consideration

i) Target Fleet

The types of vehicles that should initially be targeted for the program include Class 6 through Class 8 trucks such as refuse trucks, utility trucks, delivery trucks and beverage trucks, etc. These types of vehicles typically return to a 'home base' at the end of a shift where they can easily be fueled or have access to a natural gas fueling station on their route where they can fuel (e.g., refuse truck fueling at a CNG station at the landfill). Also, there is a track record of success with natural gas fleets of these types. Two examples in the region include Smithtown, NY, on Long Island, which has successfully contracted with a natural gas refuse collection fleet and is currently repowering dump trucks with natural gas engines; and Manhattan Beer Distributors in New York City which received a NYSERDA grant to install natural gas engines in their beverage trucks. According to Natural Gas Vehicles for America, there are approximately 120,000 natural gas vehicles operating in the U.S., including about 2,800 refuse trucks, 12,000-14,000 medium duty vehicles and 14,000 transit and school buses.³

The use of the targeted fleets is another factor that is being considered in the design of a natural gas truck program. Refuse collection trucks and delivery trucks, for instance, typically do not drive high mileage, but do operate in a fuel-consuming 'stop and go' duty cycle. For this reason, grant calculations may need to be based on fuel consumption rather than annual mileages appropriate for certain other types of trucks.

¹ Information from Clean Energy, based on study performed for California Air Resources Board, "Detailed California-modified GREET Pathway for CNG from North American Natural Gas"

² Presentation by Stephe Yborra, Director of Market Analysis, Education & Communications, NGVAmerica/Clean Vehicle Education Foundation, August 12, 2008, San Antonio, Texas.

³ Ibid.

These vehicles also tend to operate in more densely populated areas such as urban cores and residential neighborhoods where the cleaner and quieter engines benefit more people than trucks that spend most of their time on the highways.

ii) Fueling infrastructure

Because natural gas fueling infrastructure is not as widespread as that for diesel, centrally-fueled fleets are currently the most attractive target fleets for natural gas incentive programs. According to fuel supplier Nationalgrid, there are currently 19 natural gas fueling stations in the NYMTC region. Nationalgrid and Clean Energy have expressed the willingness to provide additional fueling infrastructure where needed and could be potential project partners for such a program. Also, combined public/private fleet use of fueling infrastructure is another way to maximize infrastructure use and provides emissions benefits to the region by encouraging private use of natural gas fueled vehicles.

iii) Proposed Program Eligibility

Trucks will be eligible for this program if they meet the following criteria:

1. Must have owned and operated the diesel truck in NYMTC region for past 2 years. (It should be noted that some fleets, such as goods movement fleets, register their trucks out of state, although they may be operating in the NYMTC region).
2. Vehicle must be a Class 6 and higher diesel-fueled truck (greater than 19,500 lbs. Gross Vehicle Weight Rate (GVWR). Future and expected program expansions could include Classes 4 and 5.

iv) Scrapping or Elimination Requirements

In some cases, such as public entities contracting with private fleets for refuse services, requiring the scrapping of the old diesel vehicles may not be acceptable to the private fleet. Particularly in the case of specialized and relatively expensive vehicles such as refuse trucks, the value of the old truck in the used vehicle market when compared to the value of a potential grant may make scrapping it and applying for a grant financially unattractive. The recommendation to address this issue is to provide applicants a choice between scrapping the old diesel vehicle, or permanently removing it from the state and nonattainment areas through sale or transfer of its operations. By doing this, emissions reductions of criteria pollutants in the NYMTC region would still be as permanent as scrapping a vehicle because an enforceable contract would be in place prohibiting the transferred vehicle to operate in the NYMTC region or non-attainment area again.

Although scrapping would not be required, the grant program could be structured to encourage scrapping. To illustrate, the program would set an assumed sale or transfer value, below actual market value, to be deducted from the potential grant amount. For example, setting a value of \$5,000 would allow the grantee to recoup \$2,000 of the market value of the old truck, if the market value was actually \$7,000. On the other hand, if the old truck is scrapped, no reporting of the scrap metal/parts value received would be required, allowing the grantee to effectively add the scrap value to the value of the grant, which would potentially incentivize scrapping. This achieves the goal of lowering emissions in the region while allowing for some recouping of the value of the old vehicle and encouraging fuel-switching to natural gas vehicles. The two scenarios are compared below:

	Truck A (to be scrapped)	Truck B (to be transferred)
Calculated Grant	\$100,000	\$100,000
(Pre-Set Sales/Transfer Value)	\$0	(\$5,000)
Total Grant	\$100,000	\$95,000
Actual Market Value for Scrap or Sales	\$5,000	\$7,000
“Effective Grant Benefit”	\$105,000	\$102,000

In the above example, Truck A is replacing a truck that will be completely scrapped. The calculated grant amount is \$100,000 and the applicant receives \$5,000 in scrap value, giving the applicant a ‘net’ grant amount of \$105,000. Truck B is replacing a truck that will be sold or transferred. The program has pre-set a value of \$5,000 for this type of truck, which is deducted from the calculated grant amount. The truck is actually sold for \$7,000, yielding the applicant a ‘net’ grant amount of \$102,000. In this example, scrapping is more attractive than transferring.

The dollar values used here are intended for illustrative purposes only and do not reflect actual market values. Input from truck dealers, fleet owners, and ‘blue book’ pricing should be sought while developing the pre-set sales/transfer values for appropriate trucks and model years.

As over-the-road vehicles require registration and possibly permitting, such databases could be utilized to ensure the old vehicles do not return to the region. Penalties should be put in place to ensure that sold or transfer trucks do not return to the state or nonattainment area.

v) Program Pays For

1. Up to 80% of the cost for purchasing a natural gas-fueled truck with a 2007 model year EPA compliant engine or better (including taxes and fees). Actual grant amount is based on emissions reductions achieved based upon mileage driven or fuel used in the past two years (the program will specify which type of calculation to use based upon the type of truck).
2. Purchase and install specified Global Positioning System (GPS) technology, with 7 years of monitoring. GPS provides automatic reporting of usage within designated region (e.g., nonattainment area).
3. Replacement truck would have a 100,000 mile, one year warranty.

vi) Commitments Required

It is recommended that the Natural Gas program have similar requirements as the diesel truck fleet modernization program.

1. Newer, replacement truck must be operated in the designated region for 7 years.
2. At least 75% of mileage driven must be within designated nonattainment area
3. Annual mileage cannot exceed 130% of historical annual mileage of the old truck over previous 2 years.
4. GPS must remain operational for at least 7 years.
5. Must scrap or permanently remove old truck from the state and nonattainment regions.
6. If usage and mileage commitments are not met, applicant may be required to pay back prorated amount of grant.

vii) Calculating Grant Amounts

Grants to truck owners under this natural gas truck fleet modernization program would be calculated based upon the tons of PM emissions reduced by upgrading to a new truck. The cost paid per ton would be set with either a cap for the program, for individual grants or both. Example calculations show that a 'staggered cost per ton' approach, based on model year of the old truck, is a method of funding the replacement of the oldest models with the highest grant amounts, while still allowing some funding for the replacement of later model years.

To target the older trucks and avoid excessive grants for trucks that do not drive many miles per year or have significant annual fuel usage, a tiered or staggered cost-effectiveness limit is recommended in Phase I. The program is structured to avoid granting as much for a 10-year-old vehicle or older, as one that is two years old, so the proposed approach includes cost per ton limits that differ based upon categories of engine model years (e.g., 1990 and older, 1991-1993, 1994-2003 and 2004-2006). These limits are structured to reflect changing pollutant standards as well as vehicle age to allow the

program to target specific engine years, which is why model years 1994-2003 have a higher cost per ton limit than trucks with newer 2004-2006 model year engines. California's Carl Moyer program has a formula that takes into account both PM and NOx reductions and pays similar grant amounts as those recommended for the NYMTC natural gas fleet modernization program. When PM is the only emission reduced, the Carl Moyer program effectively pays up to \$320,000 per ton and is a useful comparison for benchmarking the NYMTC natural gas program.

The recommended PM cost-effectiveness (cost-per-ton) limits are between \$325,000 and \$1.25 million per ton with a program average anticipated to be from \$273,000 to \$365,000 per ton, depending on the truck class. The higher cost per ton levels as compared to the diesel fleet modernization program reflects the higher price of the natural gas trucks and of the specialized application trucks, such as refuse collectors. This average anticipates that many of the trucks being replaced will drive more than 50,000 miles per year and that there will be significant marketing and promotion to the owners of the oldest and dirtiest trucks. Funding levels for this natural gas program have been designed to correspond with the diesel program funding levels of up to 80% of the truck price potentially funded.

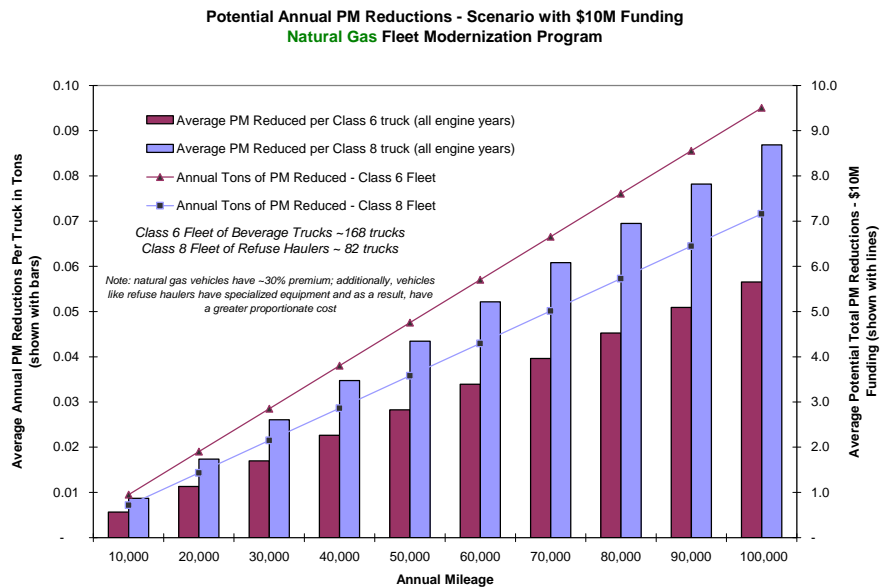
Other inputs for calculating grant amounts will be annual mileage or fuel usage, model year of the old truck and emissions standards of the replacement truck, gross vehicle weight rate and the price of the replacement truck. As stated above, it is anticipated that these calculations will be done using an internet-based tool so that the prospective program participants can see how much incentive would be provided should he or she agree to participate in the program. Other such online tools are in place elsewhere and facilitate program participation because incentive information is available immediately.

Figure 1 shows the potential annual PM reductions that a fleet modernization program could achieve with \$10 million in funding. PM reductions were estimated using an average across all engine model years and vary depending on the average annual mileage traveled (i.e., greater reductions are seen with vehicles that have higher annual mileage). The number of trucks funded with \$10 million was calculated based upon estimates of average grants (\$121,300 for Class 8, \$59,486 for Class 6); if this example fleet were comprised of 100% Class 6 trucks, approximately 168 could be funded with the program, or the program could fund over 80 Class 8 trucks. Depending on the annual mileage driven or fuel used, the potential tons reduced annually could be between 1.0 to over 9.5 tons for a Class 6 fleet and between 0.7 to over 7.2 tons for a Class 8 fleet (in general, Class 8 trucks provide greater per truck reductions, but because of higher costs, fewer may go through the program, resulting in slightly lower projected total emissions when compared to a Class 6 fleet). The incentive program is established to provide larger incentives to the oldest trucks that are driven the most miles. Therefore, the expected emission reductions are expected to be at the high end of these ranges.

It should be noted that these example calculations were made based upon assumptions on truck pricing and what engine year composition will be for program participants. Emissions calculations and the number of vehicles that can be funded by a program are very sensitive to such assumptions. Because the target fleets for natural gas vehicles includes specialty trucks, such as refuse trucks and utility trucks, the prices for these can vary widely within and among truck classes.

To illustrate, in the graph below, the total annual tons reduced by a Class 6 fleet appears to be slightly greater than a Class 8 fleet; this is driven by a slightly higher proportional cost estimate for Class 8 trucks. In our experience, however, Class 8 trucks have generally been more cost-effective projects due to their higher emissions. As this example illustrates, it is important to keep limitations in data and assumptions in mind.

Figure 1



In the above example the overall averages are as follows:

Class 8 Trucks

Tons PM reduced per truck:	0.33 tons
Grant paid	\$121,300
% Price paid	62%
Cost Per Ton	\$363,000

A similar example for Class 6 trucks yields the following averages:

Class 6 Trucks

Tons PM reduced per truck:	0.22 tons
Grant paid	\$59,486
% Price paid	65%
Cost Per Ton	\$273,000

These averages do not take into account weighting due to the actual mix of model year trucks that might apply to the program. Note: **For the calculations, a \$32,000 Federal Vehicle Purchase Tax Incentive was deducted from the estimated retail vehicle price.**

For \$10 million in program funding, a natural gas fleet modernization program could replace approximately 80 to 170 Class 6 through Class 8 diesel trucks with natural gas vehicles, with total average PM reductions of about 50 to 67 tons over seven years or 7.2 to 9.5 tons per year. Additionally, NOx and CO2 reductions would result from the program. These emissions reductions could assist the NYMTC region in meeting the transportation conformity requirements.

Figures 2 and 3 show the PM tons reduced and the cost per ton for Class 6 and Class 8 trucks.

Figure 2

**Fleet Modernization Program: PM Tons Reduced & Cost Per Ton
Class 6 Truck**

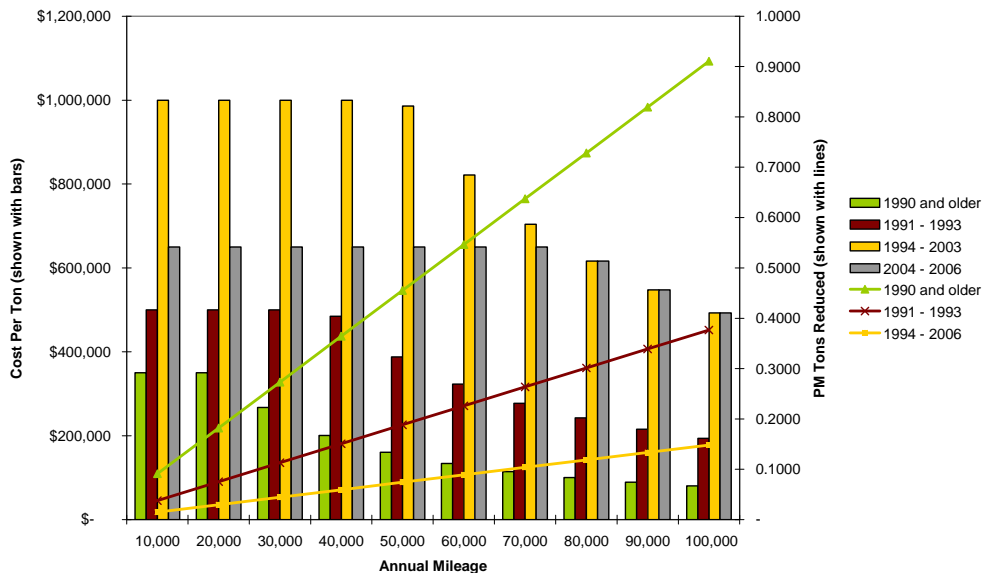
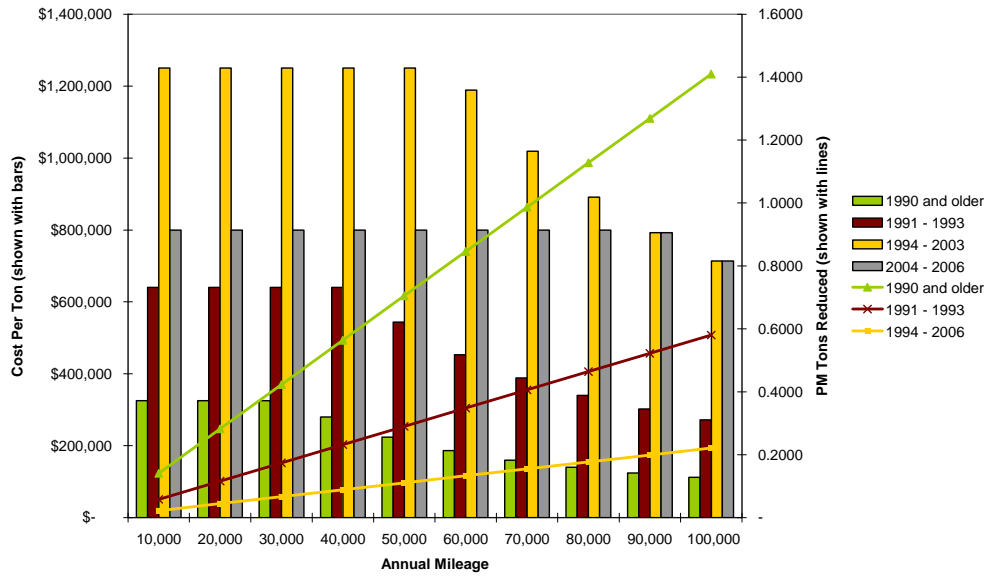


Figure 3

**Fleet Modernization Program: PM Tons Reduced & Cost Per Ton
Class 8 Truck**



Figures 4 and 5 illustrate the example grant amounts and percent of truck cost paid for Class 6 and Class 8 trucks.

Figure 4

Example Grant Amounts - Class 6 Truck

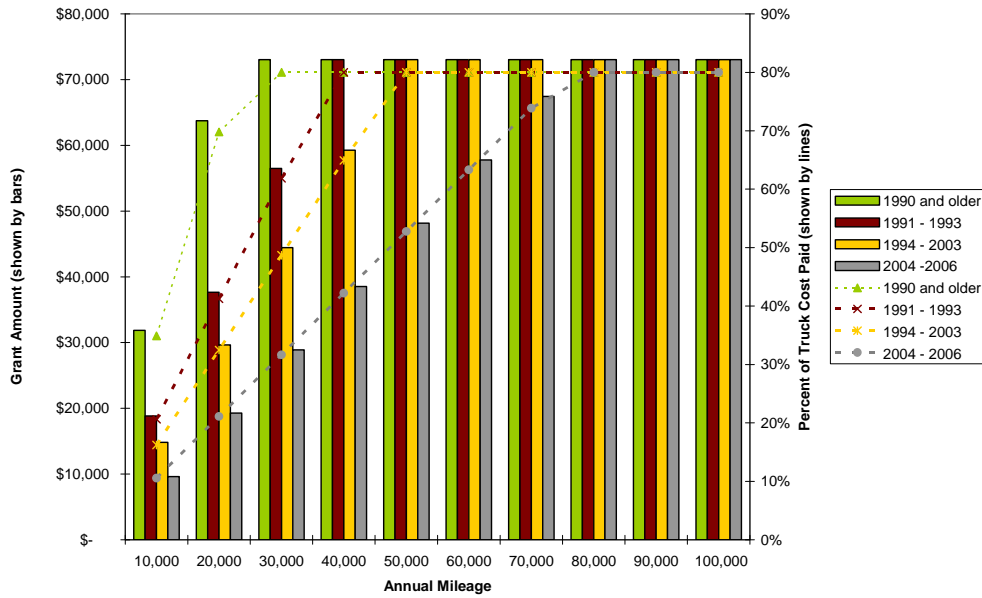
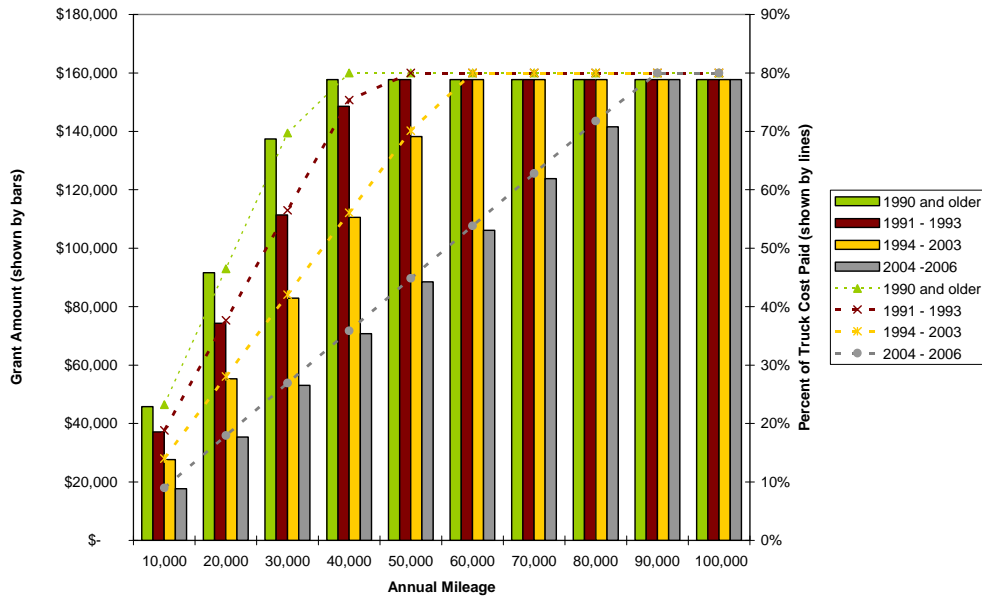


Figure 5

Example Grant Amounts - Class 8 Truck



viii) Quick Pay Rebate Program

An option developed by TCEQ for the TERP program is the Rebate Program, which requires no calculations by applicants and can pay grants in as little as four to six weeks. Grant amounts are taken from tables developed by TCEQ for various gross vehicle weight rate categories and based on truck mileage usage standards developed by the EPA. Applicants simply read the grant amount off the appropriate table and fill in their application accordingly. To maintain simplicity, it is recommended that scrapping the old vehicle be required. For the old vehicle being replaced, a default scrap value of \$1,000 is used by TCEQ, with the applicant able to retain the full scrap value actually received. To facilitate application review, the TERP program limits applicants to one vehicle per application and a maximum of ten applications per grant round. The Texas program is currently administered manually, with paper applications, however such a program could be readily adapted to an on-line application method. To provide maximum flexibility, a quick pay rebate program can be offered in tandem with a calculation-based program, which would allow applicants to transfer or sell vehicles, rather than requiring scrapping.

c) Other Natural Gas Incentives

As mentioned above, various federal and state natural gas incentives exist and have been taken into account in formulating a natural gas vehicle incentive program. The general types of incentives available include incentives for vehicle purchases, fuel sale or use, and infrastructure development. Of these, vehicle and fuel incentives will be of most initial interest to the program and applicants.

i) Federal Vehicle Purchase Tax Incentive

An income tax credit is available to the buyer of a new, dedicated alternative fuel vehicle. These credits are based on the incremental cost of the vehicle and GVWR. Credits range from \$2,500 to a maximum of \$32,000 depending on the GVWR. For vehicles over 14,000 lbs. GVWR, credits range from \$12,500 to \$32,000. The tax credit may be taken by the seller if the buyer is a tax-exempt entity, with some portion of the credit presumably passed on to the buyer. Also, an entity such as a municipality contracting with a private fleet could require within a Request for Proposal, for instance, that some portion of this tax credit to be passed on to the municipality if the contracted fleet is receiving the credit. As the full credit may not be applicable to all purchasers, grant applicants should be requested to provide the amount of credit received or expected. Although these credits are set to expire December 31, 2010 it is expected that Congress will extend these credits.

ii) Federal Motor Fuels Excise Tax Credit

A fifty cent motor fuels excise tax credit is paid to the seller per Gasoline Gallon Equivalent (GGE) of CNG sold. If the CNG is dispensed using a fueling station not open to the public, the credit may go to the user of the fuel, as the user is also the dispenser of the fuel. The CNG excise tax is 18.3 cents per GGE, however the credit is paid to eligible recipients without regard to the amount of excise tax paid, making tax-exempt entities eligible for the credit. This credit is set to expire on December 31, 2009, but it is expected that Congress will extend the sunset date.

iii) State Fuels Tax Credits

Tax credits for alternative fuels use are offered by various states. For example, the State of New York currently charges no state tax on natural gas as a motor fuel, amounting to a 44 cent per GGE tax exemption. This effectively makes all taxable entities treated the same as tax exempt entities with respect to natural gas use. This tax exemption is currently set to expire August 31, 2011.

d) Future Natural Gas Program Options

Two options that should be considered for a future natural gas vehicle program are expanding to medium and light duty fleets, and including engine repowers or natural gas conversions as eligible. Expanding the eligible fleet will reach a larger number of the delivery fleet vehicles that are prevalent in urban areas and facilitate replacing gasoline-powered as well as diesel trucks. Natural gas conversions of existing trucks have been done successfully, but available options from manufacturers are limited to specific vehicle makes and models due to EPA engine certification requirements. As interest in natural gas continues to grow, more certified options for repowers or conversions should become available in the commercial marketplace and should be included as eligible for grants.

Funding and Emissions Reduction Credits

Over the past several years funding for emission reduction programs has been made available from a number of sources. At the Federal level, these include the Diesel Emission Reduction Act (DERA) funds administered by U.S. Environmental Protection Agency (EPA), various sources of other funding from the EPA, and Congestion Mitigation and Air Quality Improvement (CMAQ) Program funds through SAFETEA-LU, the federal surface transportation authorizing legislation.

The amount of funds and processes for securing the funds varies each year, is different for each source of funding, and, for CMAQ funds, varies by state and region. Typically,

the EPA and DERA funding is quite small nationwide and is significantly oversubscribed. For example, in a recent round of funding, two EPA regions received 49 applications for \$22 Million with only approximately \$5 million available.

Additionally, on-road emission reductions can help all non-attainment areas to meet their transportation conformity requirements.

The minimum amount of funding recommended to get an incentive program started is \$25 million over a three-year period. It is also recommended that successful programs be maintained through development of on-going, multi-year revenue streams such as set asides from CMAQ funding, appropriate taxes or fees, or a combination of federal, state and locally-sourced revenue.

Given the importance of generating emission reductions that can help meet transportation conformity requirements, it is essential to document emission reductions and to determine how the reductions will be reflected in the transportation conformity determination. The EPA has various criteria for emission reductions to be accounted for in a state implementation plan (SIP) or in transportation conformity/regional emissions analysis including requiring that reductions be permanent, quantifiable and enforceable. Including the costs of installing GPS technologies and monitoring GPS data within the incentive program will greatly assist regional authorities in verifying emissions reductions.

There are a number of methods to estimate emission reductions including off-model analysis or reflecting the benefits of the program in the fleet data included in the travel demand and emissions modeling required for conformity. The EPA has released guidance documents on accounting for emission reduction credits from diesel emission reduction programs and from voluntary emission reduction programs. We recommend that this topic be discussed and resolved through conversations with EPA, regional authorities, and the FHWA/FTA.

For calculations and determining incentives, PM emissions are the principal target as illustrated in the sections above. However, for credit for transportation conformity, NO_x emissions reductions could also be calculated and taken into account. Additionally, as emphasis on reducing greenhouse gas emissions increases, the CO₂ benefits of this program would be helpful.

Conclusion

Regional, state and local governments face mounting environmental and public health challenges to address toxic air contaminants and greenhouse gas emissions, especially those emitted by mobile sources such as trucks, transit buses and delivery vehicles. Densely populated require the services provided by these trucks and buses, but residents must also share the airspace with them. On-road, heavy-duty diesel vehicles contribute

significantly to air pollution in urban areas due to the strength and horsepower of the engines themselves. Cumulatively, this legacy vehicle population produces staggering criteria pollutants, particularly ground level ozone and particulate matter, and greenhouse gas emissions on an annual basis. These pollutants are associated with respiratory illnesses, particularly in children and the elderly, while greenhouse gases contribute to global climate changes. For many communities and regional organizations, diesel-fueled fleets provide a good starting point in creating air pollution control strategies.

When faced with environmental and public health concerns derived from diesel emissions and with economic and political pressure to reduce dependence on foreign oil municipalities may find the opportunity to implement creative emissions reductions solutions. By offering incentives for the purchase of natural gas vehicles, regional agencies can generate multiple benefits for their areas, including cleaner air, transportation conformity credits, greenhouse gas reductions, noise pollution reduction, and reduced dependence on imported oil.

This report was commissioned by Natural Gas Vehicles for America and authored by Emisstar LLC, and independent consulting practice focused on energy, emissions and sustainable technologies. The purpose of this technical report was to develop a framework for a regional natural gas vehicle incentive program and illustrate its implementation within the transportation sector. Certified natural gas (CNG) vehicles produce fewer emissions than their diesel counterparts, including ozone-creating NOx, carbon monoxide and carbon dioxide. Because natural gas is a domestic resource, use of CNG vehicles support domestic producers and economies and lessen demand for imported petroleum products. Additionally, vehicles that run on natural gas produce less noise, thus contributing to a more peaceful urban environment while also producing transportation conformity credits, providing additional assets to their operators.

The report's research methodology includes interviews and analysis of existing emission reductions incentive programs to provide a detailed and informed set of administrative recommendations for a potential incentive program. Emisstar interviewed stakeholders in both public and private sectors with a working knowledge of CNG vehicles and incentive programs to better understand the strengths and weaknesses of program criteria, funding, and eligibility. Second, the authors performed a thorough review of comparable programs nationwide, including the Texas Emissions Reduction Plan and California's Carl Moyer Program. This analysis provided an in depth look into what elements helped and hindered the successful implementation of voluntary emissions reduction programs around the country. Using the research findings, the authors developed detailed recommendations for a regional natural gas vehicle program. The final framework includes recommendations for program administration structure, example calculations of emissions and other benefits, and defined program criteria, such as vehicle eligibility and scrapping requirements.

Key recommendations outlined in the report include identifying ideal target vehicle populations that support infrastructure requirements for natural gas investment while providing the greatest emission and petroleum displacement benefits. The report suggests incorporating specific incentive program eligibility and commitment requirements to ensure that emissions reductions are real, significant and surplus, including:

- Eligible trucks must have been owned and operated in the target region for the past 2 years,
- Eligible trucks will be Class 6 and higher,
- Newer, replacement truck be operated in target region for 7 years,
- At least 75% of mileage driven must be within designated nonattainment area,
- Annual mileage cannot exceed 130% of historical mileage from previous 2 years,
- GPS should be installed and remain operational for 7 years,
- Old truck must be scrapped or permanently removed from state and nonattainment regions, and
- If usage commitments are not met for the new truck, applicant may be required to pay back a prorated amount of the grant.

Recommendations specific to natural gas projects include the consideration of waste haulers and relevant business concerns. Because target vehicles such as waste haulers whose daily operations require frequent stopping and idling in urban areas, the program recommendations include the use of fuel consumption rather than annual mileage to accurately account for vehicle emissions reductions. Additionally, highly-specialized fleets like waste-haulers have high resale value in the used truck market. As such, the recommended program would allow participants to transfer these vehicles out of state permanently as an alternative to scrappage. This tactic caters to business interests, thusly encouraging greater participation in the voluntary program.

In terms of funding, the authors recommend that emissions reductions achieved provide the basis for amount of funding received. Since the region struggles particularly with particulate matter (PM), the report recommends that grant funding is based on PM reduction cost effectiveness—a benchmark industry metric. Incentive programs and governments use Cost-effectiveness statistics to compare how well a project achieves emissions goals per dollar. It is anticipated that a new NGV incentive program yields average cost effectiveness of between \$273,000 to \$365,000 per ton of PM reduced, which is comparable to other incentive grant programs.

The report provides example calculations to forecast PM reductions achieved by a new NGV incentive program with an initial funding pool of \$10 million. Replacement of approximately 80 to 170 Class 6 through Class 8 diesel trucks with new liquefied or compressed natural gas trucks yields total average PM reductions of 50 to 67 tons over 7 years (7.2 to 9.5 tons per year). Over 175 tons of NO_x and 5500 tons of greenhouse gas reductions would also be realized from the program each year. These emissions

reductions could assist regions in meeting transportation conformity requirements, as well as other local and regional air quality and energy goals.

Implementing the recommendations outlined by this report would result in an effective natural gas vehicle incentive program for New York Metropolitan area. With a focus on environmental and public health benefits and with regard to business interests, the program framework provided by this report would encourage maximum participation and air quality benefits for the region.