



Natural Gas Vehicles for America

**Analysis of Vehicle, Fuel Station and
Motor Fuels Excise Tax Incentives on
School Bus Purchase and Operating Costs**

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Executive Summary

School buses are the safest way to transport students to and from school, but chronic under-funding of school transportation budgets has resulted in a significant number of older more polluting school buses remaining in service. With more than 70% of all school buses operating on diesel fuel and increasing public concern about the impact of diesel exhaust on children's health, federal, state and local governments have been prompted to implement a variety of programs to accelerate the replacement, repower or retrofit of older school buses with newer, cleaner ones. Natural gas-powered school buses provide the greatest emission reduction and related environmental and health benefits of available alternatives. Furthermore, they displace imported petroleum. Instead, they utilize an abundant, domestically produced energy resource, and, as a proven gaseous fuel technology, advance development of hydrogen-based transportation options for the future.

Despite lower emissions and lower operating costs, natural gas bus purchase price premiums have proven to be a stumbling block for many school districts in the past. Several provisions included in the recently enacted Energy and Highway Bills dramatically improve the economic case for natural gas school buses and other district fleet vehicles. These incentives include:

- *Vehicle Purchase Income Tax Credits:* The tax credit, contained in the Energy Bill, provides an income tax credit for up to 80% of the incremental cost of a dedicated natural gas vehicle. For non-taxpaying entities, such as school districts, the tax credit can be taken by the bus seller, with some or all of the savings passed onto to the purchaser. This measure significantly reduces first cost premiums for natural gas buses, and shortens payback periods.
- *Clean School Bus USA Grants:* The Highway Bill's authorization for EPA's Clean School Bus USA grants revises how the program is to be implemented. Under new guidelines, natural gas buses, which meet more stringent emissions requirements, qualify for 50% of the entire vehicle purchase cost while so-called "clean diesel" buses, which cannot achieve the tougher emissions benchmark, qualify for only 25% funding. In most cases, this program will give natural gas school buses a first cost advantage.
- *Fuel Use Excise Tax Credits:* The Highway Bill's federal motor fuels excise tax credit for alternative fuels improves natural gas' already favorable cost differential as compared to gasoline and diesel. The measure directs the US Treasury to pay the fuel "seller" a tax credit of 50 cents per gallon of liquefied natural gas (LNG) or gasoline-gallon-equivalent (GGE) of compressed natural gas (CNG), *regardless of whether the tax was collected.* For tax-exempt entities, such as school districts, that own and operate their own fueling stations the regular "rebate" checks will go to the school district. This savings (on top of the favorable fuel price differential between natural gas and diesel fuel) will accelerate the first-cost payback (if there is a first-cost premium) and reduce NGV's already lower life-cycle cost.

These incentives are in addition to the many federal, state, regional and private sector incentives that are already in place, and, coupled with the expected increased costs of buying, operating and maintaining new diesel vehicles, substantially shift the economics in favor of natural gas school buses. This paper provides a discussion of the changing school bus economics, and includes prototype examples comparing the costs associated with purchasing new natural gas versus diesel school buses. In preparing the analyses, regional variability in bus pricing and fuel costs were taken into account, as were differences in duty-cycle (i.e. urban, suburban, rural routes) and their related impact on mpg ratings, miles driven and yearly fuel use.

Analysis of Vehicle, Fuel Station and Motor Fuels Excise Tax Incentives on School Bus Purchase and Operating Costs

Introduction

New school buses provide a number of significant health and environmental advantages over older school buses. While school buses are the safest mode of student transportation, increasing public concern over the impacts of diesel exhaust on children's health has prompted federal, state and local governments to implement a variety of programs to accelerate the replacement, repower and/or retrofit of older school buses with newer, cleaner ones. Natural gas-powered school buses provide the greatest emission reduction and related environmental and health benefits. They also offer an added advantage -- they displace oil. This is becoming an ever more-pressing concern as world oil demand and consumption outpace supply causing prices to rise, especially given the recurring political instability and volatility in key oil-producing regions of the world. Furthermore, advances in natural gas engine and vehicle technology over the past decade have brought them on par with their gasoline and diesel counterparts in terms of durability, performance and reliability. As a gaseous fuel technology, continued commercialization and market penetration of natural gas vehicles also is recognized as a critical step in the development of hydrogen-based transportation options for the future.

Despite these and other favorable attributes of NGVs, the school market segment has been slow to deploy them in great numbers primarily because of purchase price premiums. School district transportation budget requests must vie with other educational priorities, which often results in them being under funded. This leads to deferred replacement and extended vehicle operating life. Meanwhile, as tighter federal and state safety regulations are implemented, bus purchase prices are escalating. In addition, the cost of retaining skilled automotive technicians in a market where for-profit businesses are willing to pay a premium for their services, and the general increase in healthcare premiums has put upward pressure on labor costs. In this cost-sensitive environment, first-cost premiums are hard to justify unless they are offset by lower life-cycle operating costs.

In some states, chronic under funding of public schools has all but eliminated budgeting for school bus replacements on a planned basis. Buses are kept in service well beyond the national 13-year average - often up to 20 years or more - at which point, they're beyond the point of repair or no longer meet minimum safety requirements. Without the means or mechanism to generate the necessary revenues locally, these districts often rely on emergency appropriations earmarks by their legislature or on special grants from their regional Air Pollution Control Districts/Air Quality Management Districts (APCD/AQMD) to fund bus replacements. The focus in these districts is less on elimination of first-cost premiums and more on which options will garner the largest outside funding and thus the lowest cost to the local school district budget. This is the case in California, where APCD/AQMD's recognize the advantages of natural gas-powered school buses and facilitate their deployment through vehicle and fueling infrastructure grants.

The Energy and Highway Bills passed by Congress and signed into law by President Bush in August 2005 (P.L.s 109-58 and 109-59, respectively) contain several incentives targeting school buses that will substantially improve the economic case for natural gas-powered units. Two measures provide incentives that reduce purchase cost (the revised Clean School Bus USA grant program included in the Highway Bill and the Vehicle Purchase Tax Incentive measure included in the Energy Bill). Another measure, the Motor Fuels Excise Tax Credit included in the Highway bill, lowers fuel costs, thereby lessening the payback period for any premium that may exist once federal grants, tax credits and or other offsets are applied.

This analysis addresses the impacts of these measures on the purchase and operating cost of natural gas school buses using examples representing different regions of the country and different operations/duty cycles. While these examples are helpful in outlining a basic “back of the envelope” case for NGVs, a school district evaluating possible deployment of natural gas-powered buses vis-à-vis other options should conduct a more comprehensive analysis using their own mileage, vehicle mpg rating, yearly fuel use and pricing data.

Analysis Factors and Assumptions

Duty Cycles, MPG Ratings and Annual Fuel Use

School buses in urban, suburban and rural districts have different duty cycles, different yearly miles traveled and, therefore different miles-per-gallon ratings and related fuel usage. For purposes of this analysis, based on data provided by school districts representing the different applications:

- Modern urban-route school buses are assumed to travel 11,500 miles per year, achieve about 5.5 mpg of diesel fuel while on routes, and, based on conservative idle time estimates for morning start-up and winter warm-up, consume approximately 2200 gallons of fuel per year.
- Modern suburban-route school buses are assumed to travel approximately 17,000 miles per year, achieve about 6.25 mpg of diesel fuel while on routes, and, based on conservative idle time estimates for morning start-up and winter warm-up, consume approximately 2850 gallons of fuel per year.
- Modern rural-route school buses are assumed to travel approximately 21,500 miles per year, achieve about 7.25 mpg of diesel fuel while on routes, and, based on conservative idle time estimates for morning start-up and winter warm-up, consume approximately 3100 gallons of fuel per year.

Bus Purchase Costs

School bus pricing, especially pricing for Type D “transit style” buses, varies fairly significantly across the U.S. and is affected by a variety of factors including end-user options, state requirements (e.g. seat belt/restraint systems), purchase quantities (e.g. statewide bid-list vs. independent negotiations), dealer competition and order timing, among other factors. The prices used in this analysis are based on actual purchase prices reported paid by school districts within the last 6 months and/or quoted for delivery in the 2005-06 school year. These prices have been crosschecked for validity via discussions with school bus manufacturers’ regional representatives and numerous dealers.

Beginning in late 2006, the cost of 2007 model year (MY) diesel school buses will reflect significant increases in engine and emission system costs to comply with EPA heavy-duty engine emissions guidelines effective January 1st, 2007. To meet the 2007 EPA emissions requirement of 1.2 g/bhp-hr NOx and .01 g/bhp-hr PM, diesel engine manufacturers will rely upon a combination of ultra-low sulfur diesel fuel, modified engine control and combustion strategies and more complex emissions after-treatment systems. Based on field demonstrations of these technologies in the transit sector, 2007-compliant diesel engine and emission after-treatment systems will be far more costly, incur power/performance trade-offs and be more maintenance intensive than the 2004-compliant engines currently required for school buses.

On the other hand, natural gas engine manufacturers including John Deere, which is the OEM natural gas engine supplier to Blue Bird and Thomas Built, have already demonstrated that they can successfully meet the 2007 emissions standards with minor modifications to current natural gas engine technologies and will launch their 2010-compliant engines in 2007. The 2010 standard is 0.2 g/bhp-hr NOx and .01 g/bhp-hr PM. This is a significant development as vehicles that meet the tighter standard will be eligible for substantially more federal incentives. It should be noted that

Cummins Westport's natural gas engines, which are not yet offered in any OEM school buses but which are the market leader in other medium- and heavy-duty natural gas applications, also will introduce their 2010-compliant engines in 2007. These 2010-compliant engines will use relatively straightforward, proven technology with no fuel economy or maintenance penalty.

Maintenance Costs

Searches via the web and school transportation trade publications did not uncover any comprehensive peer-reviewed study of natural gas school bus versus diesel school bus maintenance costs. Based on a limited sampling of actual maintenance cost provided by school fleet managers operating both diesel-powered and natural gas-powered school buses, those that have completed the initial learning curve stage and now have optimized their NGV operations and maintenance practices concur that natural gas school buses cost between 5-10% less to maintain than their equivalent diesel counterparts. For those who are in the initial phases of NGV deployment, maintenance costs are equal to or slightly more than diesel. One difficulty encountered in comparing maintenance costs is that there are not consistent criteria for measurement. Those school districts that use similar criteria (e.g. inclusion of costs for shop supplies, parts and labor) vary widely based on the bus duty-cycle (urban, suburban, rural), technician experience level and compensation, age of school bus, driver habits and other factors.

Because natural gas combustion is far cleaner than diesel, less "soot" is generated, thus less engine wear and fouling of injectors and valves and longer oil change intervals. This would suggest more dramatic reductions in maintenance costs than 5-10% noted above. However, some of the expected savings are nullified by the higher expense of some maintenance parts and supplies. For example, while natural gas school buses require less frequent oil changes, the synthetic oils suggested for NGVs cost more, thus diminishing some of the savings. In addition, since school buses are serviced at regular intervals for other work, projected labor savings from fewer oil changes appear to be minimal. Natural gas fuel filters do not need to be replaced as often as their diesel counterparts, but they are more expensive. Conversely, as diesel engine and exhaust after-treatment strategies have become more sophisticated and expensive, the cost of maintaining diesel-powered units has risen steadily. Maintenance costs of 2007 and 2010 compliant diesel engines are expected to rise noticeably. This should not be the case with natural gas engines

A more thorough analysis of diesel and natural gas school bus maintenance costs is warranted, but it is not within the scope of this analysis. Until more comprehensive data is available, for purposes of this analysis, maintenance costs for natural gas school buses are conservatively assumed to be about equal to those of diesel school buses.

Diesel and Compressed Natural Gas Fuel Costs

For school districts, fuel costs for the 2005-06 school year are projected to be far higher than in previous years, even more so than was projected as recently as May 2005 when many districts were compiling and/or finalizing their transportation budgets for the next school year. In excess of 70% of the nation's 475,000+ school buses operate on diesel fuel. With crude oil prices projected to remain in the \$60+ per barrel range if not higher for the foreseeable future and, with refinery curtailments and other petroleum fuel distribution disruptions caused by the unusually active 2005 hurricane season, prices at the distributor and retail level are expected to remain high. Likewise, increased summertime natural gas demand by the power generation sector, diminishing production rates from existing natural gas wells, delays in adding new production and distribution capacity and the hurricane disruptions of 2005 put upward pressure on natural gas prices. As electric companies pass on their increased generations costs, natural gas compression costs may rise slightly as well.

While market prices for diesel fuel and CNG both experienced a spike in Fall 2005, natural gas prices have since fallen back closer to the market price range projected by industry and government forecasters before the 2005 hurricane season. Most areas of the country still enjoy a favorable

differential for CNG. Regional variability of the price of both fuels is quite pronounced. This may be attributed to regional supply and demand for each fuel, state-levied surcharges, local area competition, and how the public utility authority (commission, board, etc) treats vehicular natural gas fuel in the local utilities' rate bases. However, both historically and presently, natural gas is less expensive on a "diesel-gallon equivalent" (DGE) basis. For example, while the differential ranges from \$0.25-0.35/DGE in the Northeast region, it can be over \$1.30/gallon in Utah.

Looking forward, cognizant government, academic and gas and oil industry organizations forecast natural gas prices to eventually stabilize in the \$7-8/mcf level. Meanwhile, there is little optimism that the factors pushing petroleum-based fuel prices higher will wane nor will gasoline and diesel prices be immune from volatile swings due to seasonal and supply- and demand-side factors. Furthermore, the EPA requirement that 85% of all diesel fuel sold on the market by September 2006 have a sulfur content of 15 ppm or less (referred to as ultra-low sulfur diesel or ULSD fuel) alone will increase the cost per gallon at the rack by \$.08-.14/gallon.

The way in which individual school districts buy their fuel and how they fuel their vehicles also has a significant impact. Prices vary based on school district-owned-and-operated fueling facilities versus contracted fueling station use, bulk and co-operative versus individual purchasing agreements, contract versus spot-market, etc. School districts and local diesel and CNG fuel providers have provided the fuel prices used in this analysis.

Summary of Energy and Highway Bill Provisions

Federal Alternative Fuel Vehicle Tax Credits

The Energy Bill signed into law in August 2005 provides tax credits for new, dedicated alternative fuel vehicles. Unlike a competitive grant program such as the Clean School Bus USA Program described below, the vehicle tax incentive measure applies to all districts that qualify and file appropriately and, therefore, will have the greatest overall impact in the marketplace. Under the new provision, buyers of a new dedicated alternative fueled vehicle placed in service after December 31st, 2005 are eligible for a tax credit of 50% of the incremental cost of the vehicle, with an additional 30% "bonus" credit for those vehicles meeting the most stringent applicable CARB or EPA emission standard. Importantly, the law provides that, if the buyer of the vehicle is a tax-exempt entity (such as a school or municipality), the tax credit may transfer to the seller of the vehicle. In effect school districts could require that the equivalent value of the tax credit be passed along to the school in the form of lower purchase price while the seller (in this case the bus dealer) takes the tax credit.

The amount of the available credit is capped based on gross vehicle weight rating (GVWR). For example, light duty vehicles have a total incremental cost cap of \$5000. Therefore, a dedicated natural gas-powered Chevy pick-up truck that meets ULEV standards could qualify for up to \$2500 while a Honda Civic GX, which meets SULEV standards could qualify for up to \$4000 in federal tax credits (50% credit PLUS the additional 30% "bonus" credit for lower emissions). For heavy-duty vehicles with GVWR over 26,000 pounds, which includes most "C-" and "D-Type" school buses, the incremental cost cap is \$40,000, which means a dedicated natural gas-powered school bus could qualify for up to \$32,000 if the engine meets the strictest emission standard in place for heavy-duty engines, which is currently 1.8 g/bhp-hr NOx+NMHC and .1 g/bhp-hr PM (CARB). Note that the Type-D CNG buses available from both Thomas Built and Blue Bird contain the John Deere 8.1L engine, which meets the CARB optional low-NOx standard, qualifying them for the additional 30% credit.

The U.S. Treasury/IRS has not yet promulgated regulations implementing the new legislation. Based on the underlying assumptions used in crafting the legislation, however, existing petroleum-powered

vehicles that are repowered or retrofit to operate as dedicated natural gas-powered vehicles should qualify as “new dedicated alternative fuel vehicles placed in service.” Pending IRS concurrence on this principle in its rulemaking process, Small Volume OEMs (SVM) who manufacture/install EPA- and/or CARB-certified natural gas engines should qualify for the credit. For school bus applications, there are several SVMs who offer natural gas engines/systems. Emission Solutions Inc.’s NG 7.6L natural gas engine and Baytech’s 8.1 natural gas engine fueling system, both of which are available for repower/retrofit Type C/D buses carry EPA and CARB certifications to the most stringent emissions standards available, thus qualifying them for the higher credit. Hybrid Fuel Systems/DRV Energy, Baytech, BAF Technologies and Campbell Parnell Technologies offer additional certified gaseous fuel engine systems applicable to Type A and B buses as well as other light-duty vehicles. Depending on SVM, systems are available for 3.1L, 3.4L, 3.8L, 4.3L, 5.3L, 5.7L and 6.0L GM engines and 5.4L and 6.8L Ford engines. Other engine and integrated fuel system certifications are also in progress. School districts should check with these suppliers concerning availability of certified systems and applicable vehicle model years.

Clean School Bus USA Grant Program

The Clean School Bus USA provision of the Highway Bill formally recognizes this existing EPA-managed program, providing Congressional funding *authorization* of \$55 million for FY2006 and FY2007 for the replacement, repower or retrofit of existing school buses and to provide alternative fuel. Program funding for FY2008-10 is defined as “such sums as are necessary.” In formally recognizing the program, the Congressional action also sets new criteria by which the grants now will be evaluated and awarded. The new criteria establish a two-tier incentive approach to advance emissions reductions, one at a higher level of funding for meeting stricter emission requirements ahead of schedule, and another a lower level for meeting current emissions standards. Specifically, for MY2005 and MY2006 school buses, the grant provides 50% of the school bus cost if the vehicle emits 1.8 g/bhp-hr NO_x+NMHC and .1 g/bhp-hr PM but just 25% of the school bus cost if it meets the current standard of 2.5g/bhp-hr NO_x+NMHC and .1 g/bhp-hr PM. For MY 2007-09, the program raises the bar, providing 50% of the school bus cost if the vehicle meets the 2010 standard of .2 g/bhp-hr NO_x and .01g/bhp-hr PM but just 25% of the school bus cost if it meets the then current standard, expected to be 1.2 g/bhp-hr NO_x and .01 g/bhp-hr PM for 2007.

There are two significant points worth emphasizing here concerning the revised Clean School Bus USA program. First, the program is paying 50 or 25% of the *entire* cost of the school bus, not just the incremental cost of the school bus. Second, this is a competitive grant program with available funding limits set by the Congressional *appropriation* process and, furthermore, no state may receive more than 10% of the total grant appropriation. For FY2006, Congress appropriated only \$7 million for the program so no state may receive more than \$700,000. While the grant program is generous, the program’s overall limit on available funding will restrict the impact in the marketplace given the number of older buses in need of replacement.

Federal Motor Fuels Excise Tax Credits

Another key provision in the new Highway Bill is the federal motor fuels excise tax credit for alternative fuels, which beginning October 1, 2006, provides the “seller” a payment of \$.50 per gallon of LNG or gasoline-gallon-equivalent (GGE) of CNG. Importantly, the excise motor fuels tax credit will be paid on a regular basis to eligible recipients *without regard to the amount of excise tax paid*, including tax-exempt entities such as schools, municipalities and/or transit agencies, which do not pay federal excise taxes. In other words, the U.S Treasury will issue payments to sellers of alternative vehicular fuel on a regular (probably quarterly) basis, whether they paid the excise tax or not. If there is no “seller,” the credit goes to the user, e.g., if a district owns and operates its own CNG fueling station, there is no seller of CNG. This is addressed further below.

The same provision raises the CNG federal tax from its current \$.043/GGE to \$.183/GGE, making it equivalent to the federal tax paid per gallon of gasoline, and it also raises the LNG tax from \$.119 to

\$.243, making it equivalent to the federal tax paid per gallon of diesel fuel. However, as noted above, public school bus fleets do not have to pay this tax.

It is important to note that, for CNG, the excise tax credit will be paid to the “seller” of *compressed* natural gas, not just natural gas. The credit is not generated until the gas is compressed for vehicular use. The U.S. Treasury/ IRS has yet to define the word “seller” although it is clear from Bill’s language that a fleet operator who buys gas and compresses it for use in his/her own fleet is considered the “seller” of the fuel, even though no monetary transaction has taken place. A key factor in determining the amount of savings that a school district might glean by switching some or all of its fleet to CNG is whether they (1) buy their own natural gas, compress it and dispense it with their own equipment, (2) contract with an independent fuel supplier to provide them turnkey CNG fueling services, or (3) some combination of these two options. The IRS also will need to address those situations where the purchase of gas and the ownership, operation and maintenance of compressor/dispenser equipment is shared between the end-use fleet operator and a fuel service provider. Regardless, whether the fuel excise tax incentive is recouped entirely by the fleet operator for their owned-and-operated fueling station or partially credited back to the fleet by the private fuel provider in the form of lower, stable long-term fuel pricing or upgraded investment in fueling station equipment and operations, the new credit will certainly lower the cost of natural gas for vehicular use. The amount of that reduction will depend on the fueling arrangement.

Fueling Station Equipment Tax Credit

The Energy Bill includes a provision that allows for an income tax *credit* equal to 30% of the cost of any qualified alternative fuel vehicle refueling property used in a trade or business and placed into service after December 31st, 2005, up to a maximum of \$30,000 per “property” per year. As with the vehicle purchase tax credit, the fueling infrastructure tax credit can be taken by the seller of the equipment if the purchaser is a tax exempt entity, such as a school district. Furthermore, the legislation allows for the carrying forward of tax credits if the total credit available in a given year exceeds the taxable entity’s tax liability for that year. As of today, (5-15-06), final IRS guidance is still being developed. Of particular interest is how the IRS will define “property.” If its definition parallels other regulations pertaining to depreciable assets, the credit might apply to each distinct piece of equipment such as an additional compressor package skid or an additional set of storage tanks. Under this interpretation, the total value of the credit available could exceed \$30,000 per refueling station depending on the upgrades and or investments made per year. If the IRS applies a more restrictive interpretation, i.e. defining “property” as the entire refueling facility, then the total credit might be pegged at \$30,000.

The provision also includes a 30% credit for home refueling appliances with a cap of \$1000. The same provision repeals an existing \$100,000 tax *deduction* for fueling *stations*. The new measure remains in effect until December 31st, 2009.

School districts have a number of different options to fuel their CNG buses, each briefly summarized below. The “best option” will depend on location, size of fleet, available CNG infrastructure and financial resources, among other factors.

One option is to use existing CNG fueling station(s), if available. This/these may be operated by a private fuel supplier in the area (e.g. the local natural gas utility or an independent fuel provider) or another public agency that already has deployed NGVs (e.g. city public works department, local transit agency or airport authority). School districts evaluating this option should work with the provider to make sure the existing infrastructure can handle the added throughput and, if necessary, investigate options to upgrade or improve capacity. Under this option, the fuel station tax credit would be irrelevant to the school district.

If use of existing CNG fueling infrastructure is not practical, convenient or economical, it may be better to install a dedicated station on site. The size and cost of the station will vary based on whether a time-fill, fast-fill or combination-fill capability is needed; the number of vehicles to be fueled and the maximum flow rate needed during the school day; the type and sophistication of the data/payment processing system at the dispenser; the amount of space required for the station; whether equipment is purchased new or used; and other station-specific factors. This option also may be appropriate as a school district deploys greater number of NGVs and thus can justify a larger investment through economies of scale, amortization of costs across a greater vehicle inventory, etc. School districts may opt either to install and operate their own refueling station, work with an independent station developer to install, own and operate one for them, or contract with a fuel supplier to operate/maintain their station under contract. The kinds of contractual options available and the tax credit implications for on site station development, operation and maintenance are too numerous to be explored adequately here and should be investigated more thoroughly with equipment and service suppliers and/or other knowledgeable experts in your area.

Availability of Other Federal, State and Local Incentives

In addition to pursuing the federal grants and tax incentives outlined above, school districts should investigate availability of other federal, state and/or local grants to further offset purchase costs. One option is annual, federally funded programs that are allocated through state energy offices, local metropolitan planning organizations (MPOs) and/or air quality management districts (AQMDs). Examples include the Congestion Mitigation and Air Quality (CMAQ) program administered by the Federal Highway Administration and Federal Transit Administration in cooperation with state Departments of Transportation, and the US. Department of Energy's State Energy Programs (SEP) Special Projects funds, which is applied for through local Clean Cities Coalitions and administered by state energy offices. Another option is to work through the local member of Congress or Senator for a special "earmark" of funds. In addition, some states have established grant programs funded either through annual appropriations or revenue generated through permit, license and registration fees, special taxes or other funding mechanisms. Examples include the AQMD/APCD grants in California, New York State's Clean Air and Water Bond Act special projects funds and the Texas Emissions Reduction Program. The number of programs available and the rules that apply are far too numerous to list here. School districts are encouraged to talk to their local Clean Cities Coalition (if they're located in a designated CCC area) or contact their natural gas provider who can direct them to additional resources.

Confused?

There are consultants, fuel-providers, Clean Cities Coalitions and other organizations that can help your school district pull all this information together. Contact Stephe Yborra (syborra@ngvamerica.org or 301-829-2520) for help in locating someone who can help you.

Representative Examples

The addenda that follow illustrate how the federal grants and tax incentives noted above impact school districts' purchase and operating costs for natural gas buses. The examples do not include other applicable grants that may be available through state, regional or local agencies, foundations or other private sources. Fuel cost savings are assumed to be applied toward remaining first-cost premiums (if there are any) and/or toward reducing operating expenses for optimum life-cycle cost. Lifetime fuel savings are based on actual base-year savings and are not inflation-escalated for out years.

Analysis of Vehicle Purchase and Motor Fuels Excise Tax Incentives on School Bus Purchase and Operating Costs

Addenda

The following are examples of costs associated with new school bus and fuel purchases in different parts of the country, along with reductions to those costs from a combination of three federal incentives, namely, the Energy Bill's Vehicle Purchase Tax Credit or the EPA Clean School Bus USA Grant program, coupled with the Highway Bill's Motor Fuels Excise Tax Credit. It should be noted that the net cost of a natural gas bus could be far lower when other federal, state or local grants also are considered.

Simple Payback Analyses of School Bus Purchases Using Federal Vehicle Purchase Tax Credits and Motor Fuels Excise Tax Credits

California Suburban School District

	Diesel	CNG
Purchase Price Quote (pre-tax credit) ¹	\$ 98,500.00	\$ 135,800.00
Federal Vehicle Tax Credit Incentive ²	\$ -	\$ 29,840.00
First-Cost Premium ³	\$ -	\$ 7,460.00
Yearly Mileage	17000	17000
Fuel Cost per DGE ⁴	\$ 2.35	\$ 2.00
Fuel Cost w Motor Fuels Excise Tax Credit ⁵	\$ 2.35	\$ 1.80
Gallons Fuel/Year @ 6.25mpg	2,850.00	2,850.00
Yearly Fuel Cost	\$ 6,697.50	\$ 5,130.00
Yearly Fuel Savings	\$ -	\$ 1,567.50
Simple Payback (yrs)		4.76
Net fuel savings after payback (assuming 13 yr life)		\$ 12,917.50

Notes:

1. MY 2005 81-passenger Type 1 (CA) bus before tax credit.
2. Tax credit allowance based on 80% of \$37,300 incremental cost differential
3. Assumes unlikely case that no state or APCD/AQMD funds are allocated
4. Pre-excise tax credit price based on diesel purchase thru state contract, local fuel provider (CNG) w/o state or federal taxes.
5. Assumes that fuel provider reduces CNG cost/gge by \$.18, convert to dge

California Urban School District

	Diesel	CNG
Purchase Price Quote (pre-tax credit) ¹	\$ 98,500.00	\$ 134,100.00
Federal Vehicle Tax Credit Incentive ²	\$ -	\$ 28,480.00
First-Cost Premium ³	\$ -	\$ 7,120.00
Yearly Mileage	11500	11500
Fuel Cost per DGE ⁴	\$ 2.21	\$ 1.75
Fuel Cost w Motor Fuels Excise Tax Credit ⁵	\$ 2.21	\$ 1.25
Gallons Fuel/Year @ 5.5mpg	2,200.00	2,200.00
Yearly Fuel Cost	\$ 4,862.00	\$ 2,750.00
Yearly Fuel Savings	\$ -	\$ 2,112.00
Simple Payback (yrs)		3.37
Net fuel savings after payback (assuming 13 yr life)		\$ 20,336.00

Notes:

1. MY 2005 81-passenger Type 1 (CA) bus before tax credit applied;
2. Tax credit allowance based on 80% of \$35,600 incremental cost differential
3. Assumes unlikely case that no state or APCD/AQMD funds are allocated
4. Pre-excise tax credit price based on diesel purchased through state contract and fully-loaded cost per dge of a school district-owned & operated station
5. As owner-operator of CNG station, district recoups full motor fuels excise tax credit payment

California Suburban/Rural School District

	Diesel	CNG
Purchase Price Quote (pre-tax credit) ¹	\$ 98,500.00	\$ 135,800.00
Federal Vehicle Tax Credit Incentive ²	\$ -	\$ 29,840.00
First-Cost Premium ³	\$ -	\$ 7,460.00
Yearly Mileage	20000	20000
Fuel Cost per DGE ⁴	\$ 2.35	\$ 1.90
Fuel Cost w Motor Fuels Excise Tax Credit ⁵	\$ 2.35	\$ 1.60
Gallons Fuel/Year @ 7.0mpg	3,000.00	3,000.00
Yearly Fuel Cost	\$ 7,050.00	\$ 4,800.00
Yearly Fuel Savings	\$ -	\$ 2,250.00
Simple Payback (yrs)		3.32
Net fuel savings after payback (assuming 13 yr life)		\$ 21,790.00

Notes:

1. MY 2006 70-passenger Type 1 (CA) bus before tax credit.
2. Tax credit allowance based on 80% of \$37,300 incremental cost differential
3. Assumes unlikely case that no state or APCD/AQMD funds are allocated
4. Pre-excise tax credit price based on diesel purchase thru state contract, local utility tariff (CNG) w/o state or federal taxes.
5. Assumes that utility reduces CNG cost/gge by \$.27 (convert to dge)

Northeast Urban/Suburban School District

	Diesel	CNG
Purchase Price Quote (pre-tax credit) ¹	\$ 70,400.00	\$ 104,600.00
Federal Vehicle Tax Incentive ²	\$ -	\$ 27,360.00
First-Cost Premium	\$ -	\$ 6,840.00
Yearly Mileage	14000	14000
Fuel Cost per DGE ³	\$ 2.20	\$ 1.90
Fuel Cost w Motor Fuels Excise Tax Credit ⁴	\$ 2.20	\$ 1.35
Gallons Fuel/Year @ 6.0mpg	2,450.00	2,450.00
Yearly Fuel Cost	\$ 5,390.00	\$ 3,307.50
Yearly Fuel Savings	\$ -	\$ 2,082.50
Simple Payback (yrs)		3.28
Net fuel savings after payback (assuming 13 yr life)		\$ 20,232.50

Notes:

1. MY 2005 81-passenger Type D bus before credit; assumes district applies for but receives no federal or state grants.
2. Based on 80% of \$34,200 incremental cost differential
3. Pre-excise tax credit price based on city contract (diesel) and city-owned and operated CNG station
4. Assumes that city recoups and passes entire \$.50/CNG gge (convert to dge)

New York Urban/Suburban School District

	Diesel	CNG
Purchase Price Quote (pre-tax credit) ¹	\$ 77,400.00	\$ 126,400.00
Federal Vehicle Tax Incentive ²	\$ -	\$ 32,000.00
First-Cost Premium	\$ -	\$ 17,000.00
Yearly Mileage	14000	14000
Fuel Cost per DGE ³	\$ 2.25	\$ 1.95
Fuel Cost w Motor Fuels Excise Tax Credit ⁴	\$ 2.25	\$ 1.45
Gallons Fuel/Year @ 6.0mpg	2,450.00	2,450.00
Yearly Fuel Cost	\$ 5,512.50	\$ 3,552.50
Yearly Fuel Savings	\$ -	\$ 1,960.00
Simple Payback (yrs)		8.67
Net fuel savings after payback (assuming 13 yr life)		\$ 8,480.00

Notes:

1. MY 2005 81-passenger Type D bus before tax credit allowance applied; assumes district applies for but receives no federal or state grants. Also assumes premium CNG quotation due to limited dealer competition
2. Tax credit allowance based on 80% of maximum \$40,00 incremental cost differential cap
3. Price based on city contract (diesel) and school district-owned and operated CNG station (fully-loaded gas, compression and maintenance costs)
4. Assumes that school district recoups entire \$.50/CNG gge (convert to dge)

New York Urban/Suburban School District

	Diesel	CNG
Purchase Price Quote (pre-tax credit) ¹	\$ 77,400.00	\$ 117,400.00
Federal Vehicle Tax Incentive ²	\$ -	\$ 32,000.00
First-Cost Premium	\$ -	\$ 8,000.00
Yearly Mileage	14000	14000
Fuel Cost per DGE ³	\$ 2.25	\$ 1.95
Fuel Cost w Motor Fuels Excise Tax Credit ⁴	\$ 2.25	\$ 1.65
Gallons Fuel/Year @ 6.0mpg	2,450.00	2,450.00
Yearly Fuel Cost	\$ 5,512.50	\$ 4,042.50
Yearly Fuel Savings	\$ -	\$ 1,470.00
Simple Payback (yrs)		5.44
Net fuel savings after payback (assuming 13 yr life)		\$ 11,110.00

Notes:

1. MY 2005 81-passenger Type D bus before tax credit allowance applied; assumes district applies for but receives no federal or state grants. Unlike example above, assumes competitive CNG quotation
2. Tax credit allowance based on 80% of 40,000 incremental cost differential cap
3. Price based on city contract (diesel) and utility CNG station (tax exempt)
4. Assumes that motor fuels excise tax credit allows utility to reduce cost by \$.27/CNG gge (convert to dge = \$.30)

Utah Urban/Suburban School District

	Diesel	CNG
Purchase Price Quote (pre-tax credit) ¹	\$ 87,000.00	\$ 116,800.00
Federal Vehicle Tax Credit Incentive ²	\$ -	\$ 23,840.00
First-Cost Premium	\$ -	\$ 5,960.00
Yearly Mileage	16000	16000
Fuel Cost per DGE ³	\$ 2.35	\$ 1.35
Fuel Cost w Motor Fuels Excise Tax Credit ⁴	\$ 2.35	\$ 1.05
Gallons Fuel/Year @ 6.0mpg	2,800.00	2,800.00
Yearly Fuel Cost	\$ 6,580.00	\$ 2,940.00
Yearly Fuel Savings	\$ -	\$ 3,640.00
Simple Payback (yrs)		1.64
Net fuel savings after payback (assuming 13 yr life)		\$ 41,360.00

Notes:

1. MY 2005 81-passenger Type D bus before credit; assumes district applies for but receives no federal or state grants.

2. Based on 80% of \$29,800 incremental cost differential

3. Pre-excise tax credit price based on city contract (diesel) and utility-owned and operated CNG station

4. Assumes that fuels excise tax credit allows utility to pass on \$.27/CNG gge (convert to dge)

Simple Payback Analyses of School Bus Purchases Using Clean School Bus USA Grant and Motor Fuels Excise Tax Credits

California Suburban School District

	Diesel	CNG
Purchase Price Quote ¹	\$ 108,500.00	\$ 145,800.00
After Clean School Bus USA Grant Award ²	\$ 81,375.00	\$ 72,900.00
First-Cost Premium ³	\$ 8,475.00	
Yearly Mileage	17000	17000
Fuel Cost per DGE ⁴	\$ 2.35	\$ 2.00
Fuel Cost w Motor Fuels Excise Tax Credit ⁵	\$ 2.35	\$ 1.80
Gallons Fuel/Year @ 6.25mpg	2,850.00	2,850.00
Yearly Fuel Cost	\$ 6,697.50	\$ 5,130.00
Yearly Fuel Savings	\$ -	\$ 1,567.50
Simple Payback (yrs)		n/a
Net savings (assuming 13 yr life)		\$ 28,852.50

Notes:

1. MY 2006 70-passenger Type 1 bus (3-pt seat restraint system rule in effect). Diesel bus meets 2004 2.5NOx/.10PM requirement; CNG bus meets CARB Low-NOX 1.8NOx/.10PM
2. Clean School Bus USA Grant formula: 25% of diesel, 50%of CNG
3. Assumes unlikely case that no state or APCD/AQMD funds are allocated
4. Pre-excise tax credit price based on diesel purchase thru state contract, local fuel provider (CNG) without state or federal taxes.
5. Assumes that fuel provider reduces CNG cost/gge by \$.18, convert to dge

California Urban School District

	Diesel	CNG
Purchase Price Quote ¹	\$ 108,500.00	\$ 144,100.00
After Clean School Bus USA Grant Award ²	\$ 81,375.00	\$ 72,050.00
First-Cost Premium ³	\$ 9,325.00	
Yearly Mileage	11500	11500
Fuel Cost per DGE ⁴	\$ 2.21	\$ 1.75
Fuel Cost w Motor Fuels Excise Tax Credit ⁵	\$ 2.21	\$ 1.25
Gallons Fuel/Year @ 5.5mpg	2,200.00	2,200.00
Yearly Fuel Cost	\$ 4,862.00	\$ 2,750.00
Yearly Fuel Savings	\$ -	\$ 2,112.00
Simple Payback (yrs)		n/a
Net savings (assuming 13 yr life)		\$ 36,781.00

Notes:

1. MY 2006 70-passenger Type 1 bus (3-pt seat restraint system rule in effect). Diesel bus meets 2004 2.5NOx/.10PM requirement; CNG bus meets CARB Low-NOX 1.8NOx/.10PM
2. Clean School Bus USA Grant formula: 25% of diesel, 50%of CNG
3. Assumes unlikely case that no state or APCD/AQMD funds are allocated
4. Pre-excise tax credit price based on diesel purchased through state contract and fully-loaded cost per dge of a school district-owned & operated station
5. As owner-operator of CNG station, district recoups full motor fuels excise tax credit payment

California Suburban/Rural School District

	Diesel	CNG
Purchase Price Quote ¹	\$ 108,500.00	\$ 145,800.00
After Clean School Bus USA Grant Award ²	\$ 81,375.00	\$ 72,900.00
First-Cost Premium ³	\$ 8,475.00	
Yearly Mileage	20000	20000
Fuel Cost per DGE ⁴	\$ 2.35	\$ 1.90
Fuel Cost w Motor Fuels Excise Tax Credit ⁵	\$ 2.35	\$ 1.60
Gallons Fuel/Year @ 7.0mpg	3,000.00	3,000.00
Yearly Fuel Cost	\$ 7,050.00	\$ 4,800.00
Yearly Fuel Savings	\$ -	\$ 2,250.00
Simple Payback (yrs)		n/a
Net savings (assuming 13 yr life)		\$ 37,725.00

Notes:

1. MY 2006 70-passenger Type 1 bus (3-pt seat restraint system rule in effect). Diesel bus meets 2004 2.5NOx/.10PM requirement; CNG bus meets CARB Low-NOX 1.8NOx/.10PM
2. Clean School Bus USA Grant formula: 25% of diesel, 50%of CNG
3. Assumes unlikely case that no state or APCD/AQMD funds are allocated
4. Pre-excise tax credit price based on diesel purchase thru state contract, local utility tariff (CNG) w/o state or federal taxes.
5. Assumes that utility reduces CNG cost/gge by \$.27 (convert to dge)

Northeast Urban/Suburban School District

	Diesel	CNG
Purchase Price Quote ¹	\$ 77,440.00	\$ 109,830.00
After Clean School Bus USA Grant Award ²	\$ 58,080.00	\$ 54,915.00
First-Cost Premium ³	\$ 3,165.00	
Yearly Mileage	14000	14000
Fuel Cost per DGE ³	\$ 2.20	\$ 1.90
Fuel Cost w Motor Fuels Excise Tax Credit ⁴	\$ 2.20	\$ 1.35
Gallons Fuel/Year @ 6.0mpg	2,450.00	2,450.00
Yearly Fuel Cost	\$ 5,390.00	\$ 3,307.50
Yearly Fuel Savings	\$ -	\$ 2,082.50
Simple Payback (yrs)		n/a
Net savings (assuming 13 yr life)		\$ 30,237.50

Notes:

1. MY 2006 81-passenger Type D bus; assumes diesel unit has 10% increase and CNG unit 5% increase over 2005 MY equivalent bus. Also assumes district receives no state grants.
2. Clean School Bus USA Grant formula: 25% of diesel, 50% of CNG
3. Pre-excise tax credit price based on city contract (diesel) and city-owned and operated CNG station
4. Assumes that city recoups and passes on entire \$.50/CNG gge (convert to dge)

New York Urban/Suburban School District

	Diesel	CNG
Purchase Price Quote ¹	\$ 85,140.00	\$ 132,720.00
Clean School Bus USA Grant Award ²	\$ 63,855.00	\$ 66,360.00
First-Cost Premium ³		\$ 2,505.00
Yearly Mileage	14000	14000
Fuel Cost per DGE ³	\$ 2.25	\$ 1.95
Fuel Cost w Motor Fuels Excise Tax Credit ⁴	\$ 2.25	\$ 1.45
Gallons Fuel/Year @ 6.0mpg	2,450.00	2,450.00
Yearly Fuel Cost	\$ 5,512.50	\$ 3,552.50
Yearly Fuel Savings	\$ -	\$ 1,960.00
Simple Payback (yrs)		1.28
Net savings (assuming 13 yr life)		\$ 22,975.00

Notes:

1. MY 2006 81-passenger Type D bus; assumes diesel unit has 10% increase and CNG unit 5% increase over 2005 MY equivalent bus. Also assumes district receives no state grants.
2. Clean School Bus USA Grant formula: 25% of diesel, 50% of CNG
3. Price based on city contract (diesel) and school district-owned and operated CNG station (fully-loaded gas, compression and maintenance costs)
4. Assumes that school district recoups entire \$.50/CNG gge (convert to dge)

New York Urban/Suburban School District

	Diesel	CNG
Purchase Price Quote (pre-tax credit) ¹	\$ 85,140.00	\$ 123,270.00
After Clean School Bus USA Grant Award ²	\$ 63,855.00	\$ 61,635.00
First-Cost Premium ³	\$ 2,220.00	
Yearly Mileage	14000	14000
Fuel Cost per DGE ³	\$ 2.25	\$ 1.95
Fuel Cost w Motor Fuels Excise Tax Credit ⁴	\$ 2.25	\$ 1.65
Gallons Fuel/Year @ 6.0mpg	2,450.00	2,450.00
Yearly Fuel Cost	\$ 5,512.50	\$ 4,042.50
Yearly Fuel Savings	\$ -	\$ 1,470.00
Simple Payback (yrs)		n/a
Net savings (assuming 13 yr life)		\$ 21,330.00

Notes:

1. MY 2006 81-passenger Type D bus; assumes diesel unit has 10% increase and CNG unit 5% increase over 2005 MY equivalent bus. Also assumes district receives no state grants.
2. Clean School Bus USA Grant formula: 25% of diesel, 50% of CNG
3. Price based on city contract (diesel) and utility CNG station (tax exempt)
4. Assumes that motor fuels excise tax credit allows utility to reduce cost by \$.27/CNG gge (convert to dge = \$.30)

Utah Urban/Suburban School District

	Diesel	CNG
Purchase Price Quote (pre-tax credit) ¹	\$ 95,700.00	\$ 122,640.00
After Clean School Bus USA Grant Award ²	\$ 71,775.00	\$ 61,320.00
First-Cost Premium ³	\$ 10,455.00	
Yearly Mileage	16000	16000
Fuel Cost per DGE ³	\$ 2.35	\$ 1.35
Fuel Cost w Motor Fuels Excise Tax Credit ⁴	\$ 2.35	\$ 1.05
Gallons Fuel/Year @ 6.0mpg	2,800.00	2,800.00
Yearly Fuel Cost	\$ 6,580.00	\$ 2,940.00
Yearly Fuel Savings	\$ -	\$ 3,640.00
Simple Payback (yrs)		n/a
Net savings (assuming 13 yr life)		\$ 57,775.00

Notes:

1. MY 2006 81-passenger Type D bus; assumes diesel unit has 10% increase and CNG unit 5% increase over 2005 MY equivalent bus. Also assumes district receives no state grants.
2. Clean School Bus USA Grant formula: 25% of diesel, 50% of CNG
3. Pre-excise tax credit price based on city contract (diesel) and utility-owned and operated CNG station
4. Assumes that fuels excise tax credit allows utility to pass on \$.27/CNG gge (convert to dge)