STAFF MEETING MINUTES
LANCASTER COUNTY BOARD OF COMMISSIONERS
COUNTY-CITY BUILDING, ROOM 113
THURSDAY, APRIL 26, 2012
8:30 A.M.

Commissioners Present:	Larry Hudkins, Vice Chair Bernie Heier Jane Raybould Brent Smoyer
Commissioners Absent:	Deb Schorr, Chair
Others Present:	Kerry Eagan, Chief Administrative Officer Gwen Thorpe, Deputy Chief Administrative Officer Dan Nolte, Lancaster County Clerk Cori Beattie, Deputy County Clerk Ann Taylor, County Clerk's Office

Advance public notice of the Board of Commissioners Staff Meeting was posted on the County-City Building bulletin board and the Lancaster County, Nebraska, web site and provided to the media on April 25, 2012.

The Vice Chair noted the location of the Open Meetings Act and opened the meeting at 8:30 a.m.

AGENDA ITEM

1 APPROVAL OF THE MINUTES OF THE THURSDAY, APRIL 19, 2012 STAFF MEETING

MOTION: Heier moved and Smoyer seconded approval of the minutes of the April 19, 2012 Staff Meeting. Smoyer, Raybould, Heier and Hudkins voted aye. Schorr was absent from voting. Motion carried 4-0.

2 ADDITIONS TO THE AGENDA

None were stated.

3 COMPENSATORY TIME USE DURING BOARD OF EQUALIZATION - Dan Nolte, County Clerk; Pat Kant, Personnel Coordinator; Tom Fox, Deputy County Attorney

Dan Nolte, County Clerk, said he anticipates the need for overtime in his office over the summer months, due to a staff shortage and a large number of property valuation protest filings. He said one employee has requested compensatory time instead of overtime pay. Nolte said the use of compensatory time requires Board approval, adding it has been approved for the Sheriff's Department in the past.

Pat Kant, Personnel Coordinator, said accrual is at a rate of time and a half, adding employees can accrue up to 20 hours of compensatory time.

Nolte said if the employee is unable to use their compensatory time, there will be a payout at a rate of time and a half.

Tom Fox, Deputy County Attorney, said employees requesting comprehensive time must sign an agreement that stipulates the terms. He said the value of the employee's compensatory time bank will reflect any salary increases and if the employee separates from the County, they will receive a payout at the current rate.

Cori Beattie, Deputy County Clerk, noted that the office also utilizes flex time as an option.

Board consensus was to allow the County Clerk's Office to proceed as outlined.

4 ADDITIONAL APPROPRIATIONS LETTER - Dennis Meyer, Budget and Fiscal Officer

Dennis Meyer, Budget and Fiscal Officer, requested authorization to send out the letter (see agenda packet).

MOTION: Heier moved and Raybould seconded to authorize the additional appropriations letter to be sent to all county departments, with signature by the Vice Chair. Raybould, Smoyer, Heier and Hudkins voted aye. Schorr was absent from voting. Motion carried 4-0.

5 NATURAL GAS VEHICLES - Tim Hess, Black Hills Energy; Milo Mumgaard, Mayor's Senior Policy Aide for Sustainability

Tim Hess, Black Hills Energy (BH), discussed natural gas vehicles (NGV's) in public and private fleets, noting the following benefits (Exhibits A & B):

- Natural gas is America's fuel
- NGV's reduce exhaust emissions
- Lower fuel and maintenance costs

Hess noted that BH plans to open its fueling station to the public by the end of October.

In response to a question from Hudkins, Hess said there are no tax incentives for NGV's at present. Board consensus was to add it to the legislative list.

MOTION: Heier moved and Smoyer seconded to contact the University of Nebraska-Lincoln (UNL) about a possible intern to do a feasibility study of conversion of the County's vehicles to natural gas vehicles (NGV's). Heier, Smoyer, Raybould and Hudkins voted aye. Schorr was absent from voting. Motion carried 4-0.

Hess noted that BH is offering financial incentives on the conversion of vehicles that are in place by the end of the year. He said the incentives are based on the amount of fuel that is being displaced and converted over to natural gas.

Milo Mumgaard, Mayor's Senior Policy Aide for Sustainability, said the City has a couple of initiatives in place: 1) The Lincoln City Libraries Bookmobile will be a compressed natural gas (CNG) vehicle; and 2) The purchase of two (2) CNG vehicles for the Building and Safety Department. He said the City would be interested in working with the County on the feasibility study. Mumgaard said several representatives of the City will be going to Kansas City on May 25th to discuss their fleet and invited County officials to join them.

ADMINISTRATIVE OFFICER REPORT

B. Claims for Review: Payment Voucher No. 352019 from Emergency Management for $59.96 (This Claim is Beyond the 90 Day Time Period)

MOTION: Heier moved and Smoyer seconded to handle the claim through the regular claims process. Heier, Smoyer, Raybould and Hudkins voted aye. Schorr was absent from voting. Motion carried 4-0.

6 A) INVITATION TO NEGOTIATE (ITN) FOR COMMUNITY MENTAL HEALTH CENTER (CMHC); AND B) CRISIS CENTER - C. J. Johnson, Region V Systems Administrator; Dean Settle, Community Mental Health Center (CMHC) Director; Ron Sorensen, Appointed CMHC Director

A) Invitation to Negotiate (ITN) for Community Mental Health Center (CMHC)

Hudkins said the Chair has asked that the committee reviewing responses to the Invitation to Negotiate (ITN) (see April 12, 2012 Staff Meeting minutes) be broadened to include Judy Halstead, Lincoln-Lancaster County Health Department (LLCHD) Director, and a representative from the Lincoln Police Department (LPD). Kerry Eagan, Chief Administrative Officer, said questions have also been raised about the appropriateness of having CMHC employees serve on a committee that is reviewing their agency. Dean Settle, CMHC Director, suggested it may be better to have them serve as a resource to avoid the appearance of a conflict of interest. Raybould said she is a proponent of including staff in matters like this because of their operational expertise. She added they will have a responsibility to relay information back to the rest of the staff and assist with buy-in and implementation. Ron Sorensen, Appointed CMHC Director, said he does not feel strongly either way but wants to ensure there is staff involvement. Smoyer suggested that staff vote on their two representatives. Settle asked that he and Sorensen be allowed to seek input from their Management Team. There was no objection to the request.

MOTION: Smoyer moved and Raybould seconded to include Judy Halstead, Lincoln-Lancaster County Health Department (LLCHD) Director, and a representative from the Lincoln Police Department (LPD), to be designated by the Chief of Police. Heier, Raybould, Smoyer and Hudkins voted aye. Schorr was absent from voting. Motion carried 4-0.

Eagan said he is working with Sorensen, Johnson and Brittany Behrens, Deputy County Attorney, on the Memorandum of Understanding (MOU) between the County and Region V. He said the essential core services and the County's interest going forward need to be defined. A workplan was presented (Exhibit C). Raybould suggested some revisions to starting dates. She also asked that information be shared with the CMHC Advisory Committee.

Settle presented baseline data from the last quarter of 2011 (Exhibit D). **NOTE:** The number of mental health related incidents in Lincoln's public libraries only relates to Bennett Martin Public Library, which is located in downtown Lincoln. He estimated that the rehospitalization rate for CMHC's community support clients is 3%, which he said could triple if those services are eliminated.

In response to a question from Raybould, Settle estimated the cost of hospitalization at $1,200 per day compared to $300 a month for case management services.

Heier requested a cost comparison to Douglas County.

B) Crisis Center

Settle said if the Board decides to maintain operation of the Crisis Center and move other services to other providers, there will be costs to replace support services.

Eagan noted that the Crisis Center serves all of the counties in Region V and said if there are additional costs to maintain the Crisis Center, it is possible they could be recovered through that agreement.

In response to a question from Heier, Johnson said there are approximately 615 Emergency Protective Custody (EPC) admissions to the Crisis Center each year. He said 82% are from Lancaster County even though Lancaster County is about 62% of the population. Johnson recommended the County maintain the Crisis Center for the next couple of years and then look at contracting its operations. He advised the County to maintain a direct say over operation of the Crisis Center as it relates to many other aspects of County government (law enforcement, jail, etc.).

Board consensus was to direct staff to begin developing a plan on what it would take to retain the Crisis Center.

7 A) GEIGER ACCESS AGREEMENT FOR PESTER RIDGE ROAD; AND B) PLANNING COMMISSION MEMBERSHIP RESOLUTION - Brittany Behrens, Deputy County Attorney

A) Geiger Access Agreement for Pester Ridge Road

Brittany Behrens, Deputy County Attorney, said it appears from discussion at the April 12th Staff Meeting that the Board is comfortable with Larry Geiger, the property owner, making the determination regarding the instability or safety of the current access road and when it would be appropriate to use Pester Ridge Road. Raybould said she believes the agreement should reflect that the determination will be based on recommendations from the general contractor. She said the agreement should also stipulate who is responsible for placement and removal of the barricade. Eagan noted that the agreement can be cancelled by the County Board on 15 days notice.

The Board scheduled the agreement on the May 1, 2012 County Board of Commissioners Meeting agenda for action.

B) Planning Commission Membership Resolution

Heier noted the Board passed a motion at the April 19th Staff Meeting to have the Planning Commission consist of at least four members from outside the Lincoln city limits, whose names would be submitted by the Lancaster County Board for appointment by the Mayor, with the next four vacancies filled by names from the Lancaster County Board. He felt that action should be in resolution form.

Behrens said a County Resolution and a City Ordinance, which are essentially the same documents, govern the Planning Commission with regard to process and appointments to that body. She said they state:

> *The Lincoln City-Lancaster County Planning Commission shall consist of nine members who shall represent, insofar as possible, different professions or occupations in the municipality, who shall be appointed by the Mayor and with the approval of a three-fourths vote of the City Council and an affirmative vote of the majority of the County Board of Commissioners.*

Behrens said the Board has two options: 1) Negotiate with the City for a new interlocal agreement that has new conditions and a new process for appointments; and 2) Continue not approving, by a majority vote of the Board, the appointments brought forward by the Mayor.

Behrens said a resolution was drafted in 2005 that addressed the issue of representation in the City's three-mile zoning jurisdiction but was never adopted. Hudkins asked her to supply a copy to the Board.

Raybould said she was told 95% of the issues addressed by the Planning Commission relate to the City's jurisdiction. Heier cited decisions the Planning Commission made on the "Bennet Corner" interchange and the Lincoln-Lancaster County 2040 Comprehensive Plan as examples of important decisions that were different than the County Board's.

Hudkins added several of the Planning Commission members who served as the County representative felt they were given little consideration.

Board consensus was to have the Chair and Vice Chair discuss the matter with the Mayor.

8 ACTION ITEMS

A. Request from Sue Eckley, County Risk Manager, for May 10, 2012 Paycheck Insert on Blood Chemistry Profiles

MOTION: Heier moved and Raybould seconded approval. Raybould, Heier, Smoyer and Hudkins voted aye. Schorr was absent from voting. Motion carried 4-0.

9 CONSENT ITEMS

There were no consent items.

10 ADMINISTRATIVE OFFICER REPORT

A. Board of Health Appointments (David R. Smith and Ed Schneider - Reappointments; Marcia White - New Appointment)

The Board scheduled the item on the May 1, 2012 County Board of Commissioners Meeting agenda.

B. Claims for Review: Payment Voucher No. 352019 from Emergency Management for $59.96 (This Claim is Beyond the 90 Day Time Period)

Item was moved forward on the agenda.

C. County Attorney Standards Advisory Council

Smoyer and Raybould expressed interest in serving on the County Attorney Standards Advisory Council. Board consensus was to submit both of their names to the Governor's Office for consideration.

11 DISCUSSION OF BOARD MEMBER MEETINGS

A. Human Services Joint Budget Committee (JBC) - Schorr, Raybould

Raybould said they discussed funding requests, which total $1,700,000. She said one of the issues of concern is how much the County will commit to funding.

B. Lincoln Independent Business Association (LIBA) Monthly Meeting - Smoyer

Smoyer said discussion focused on the Lancaster Event Center, i.e., funding, events and management.

C. Lancaster County Correctional Facility Joint Public Agency (JPA) - Schorr, Hudkins

Hudkins said they approved claims totaling $872,649.93 from Wells Fargo for bank fees, Sampson Construction Company, the Construction Manager at-risk, and The Clark Enersen Partners, architect for the project.

D. Community Mental Health Center (CMHC) Advisory Committee - Raybould

Raybould said Ron Sorensen, Appointed Community Mental Health Center (CMHC) Director, was introduced to the group. She also reported that they received a financial report and legislative update.

12 EMERGENCY ITEMS AND OTHER BUSINESS

There were no emergency items or other business.

13 ADJOURNMENT

MOTION: Heier moved and Smoyer seconded to adjourn the meeting at 10:56 a.m. Smoyer, Heier Raybould and Hudkins voted aye. Schorr was absent from voting. Motion carried 4-0.

Dan Nolte
Lancaster County Clerk

EXHIBIT
tabbies
A

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NGVs in Public and Private Fleets

Lancaster County NGV Presentation – Lincoln, NE
April 26, 2012

Black Hills Energy Presenter: Tim Hess, Manager, Gas Marketing
Presentation slides: Clean Vehicle Education Foundation/NGVAmerica & EIA

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Natural Gas Vehicles

- Natural gas is America's fuel
  - America's resource
  - America's jobs
  - Reduced reliance on foreign oil supplies

- New NGV reduce exhaust emissions:
  - Carbon monoxide (CO) by 70 percent – 90 percent
  - Non-methane organic gas (NMOG) by 50 – 75 percent
  - Nitrogen oxides (NOx) by 75 – 95 percent
  - Carbon dioxide (CO2) by 20 – 30 percent

- Lower fuel / O&M costs
  - Fast payback of initial purchase premium
  - Generate substantial life-cycle savings

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Natural Gas Vehicles

- Natural Gas engine performance
  - match/exceed diesel, gasoline
- Wide variety of LD, MD & HD vehicles.
  - GM, Ford, Honda, Foton America Bus, Freightliner, Kalmar Industries, ElDorado National, StarTrans, Elgin Sweepers, Blue Bird, Thomas Built, Crane Carrier, McNeilus, Kenworth
- Vigorous NGV fueling industry emerging, expanding options
  - Angi Compressors, TGT, Galileo, Phill Maker, IMW, Greenfield, Mid-American CNG, Midwest Energy Solutions, NatGas Svcs.

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Market Drivers of Change

Energy Security and Economics

- CNG savings compared to diesel is @ $2.00 less per DGE
  - Differential high was $2.50 in 05/08
  - Future differential is ? depending on world events!
- CNG savings compared to gasoline is @ $1.80 less per GGE

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Why Should We Care?

Sending money abroad!

- More than $41.6 billion in March '12
  – or –
  $931,900 per minute

- Imported 59% of U.S. Requirements
  - or -
  332 Billion Barrels

(Sourced by Pickens Plan website)

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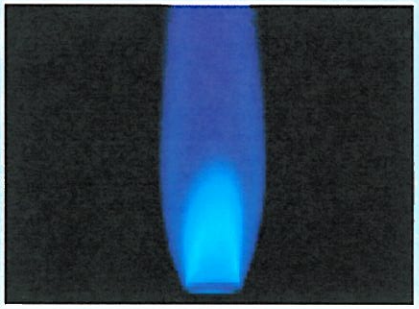
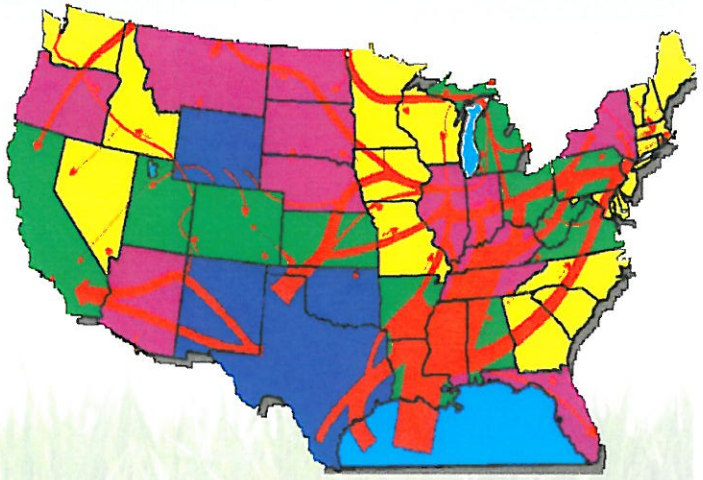
Facts About Natural Gas



- Natural gas is abundant domestic fuel
  - 98+% from North America (~87% US, ~12% Canada, ~1-2% imported LNG)
  - Well-developed distribution infrastructure
    - 290K miles of interstate pipeline
    - 1.2 million miles of LDC lines
  - American fuel = American jobs
  - Improved technologies made shale gas economically viable
  - Supply now estimated @ 100+yrs!



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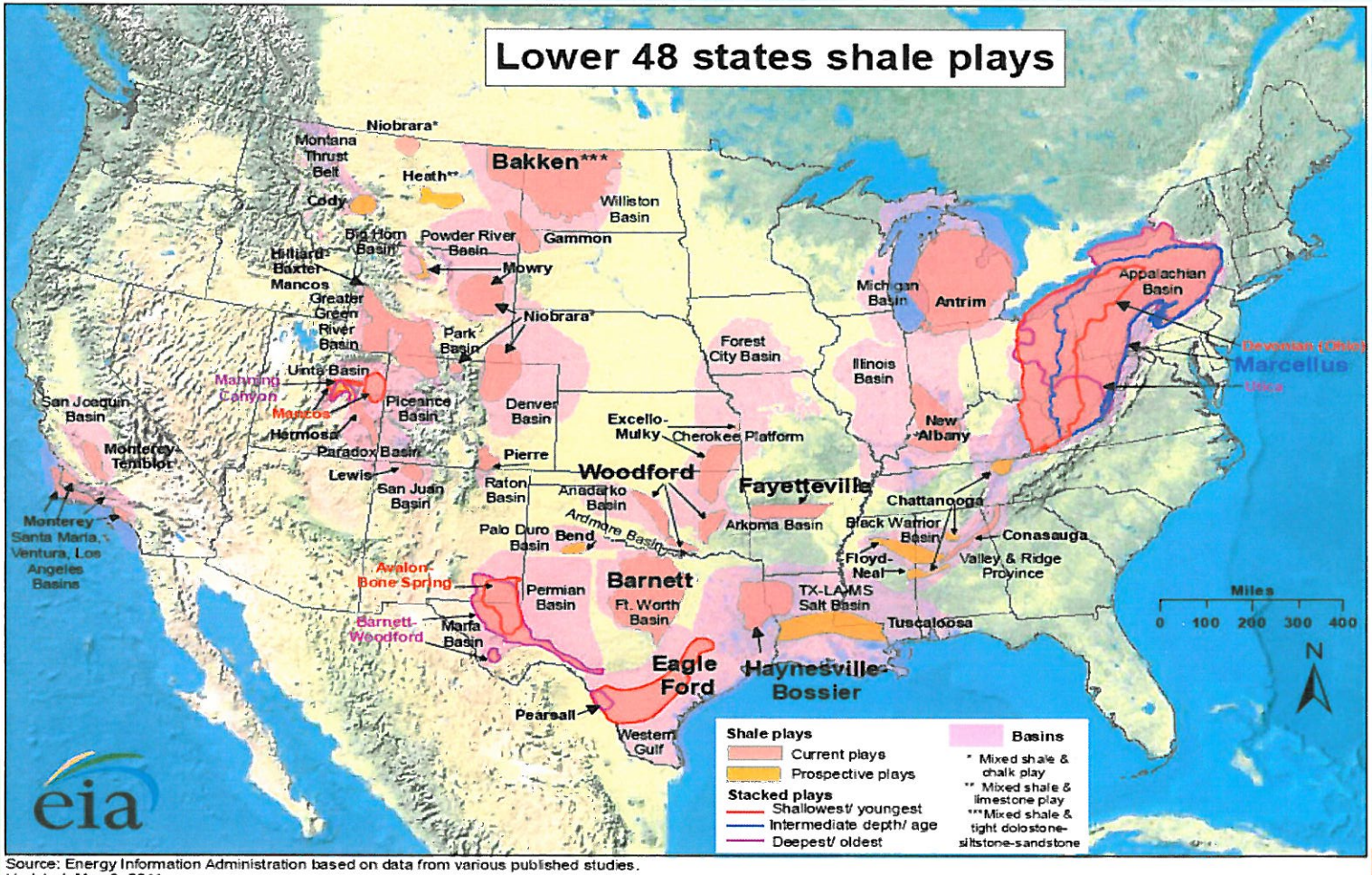
Shale Gas Sources



Source: Energy Information Administration based on data from various published studies.
Updated: May 9, 2011

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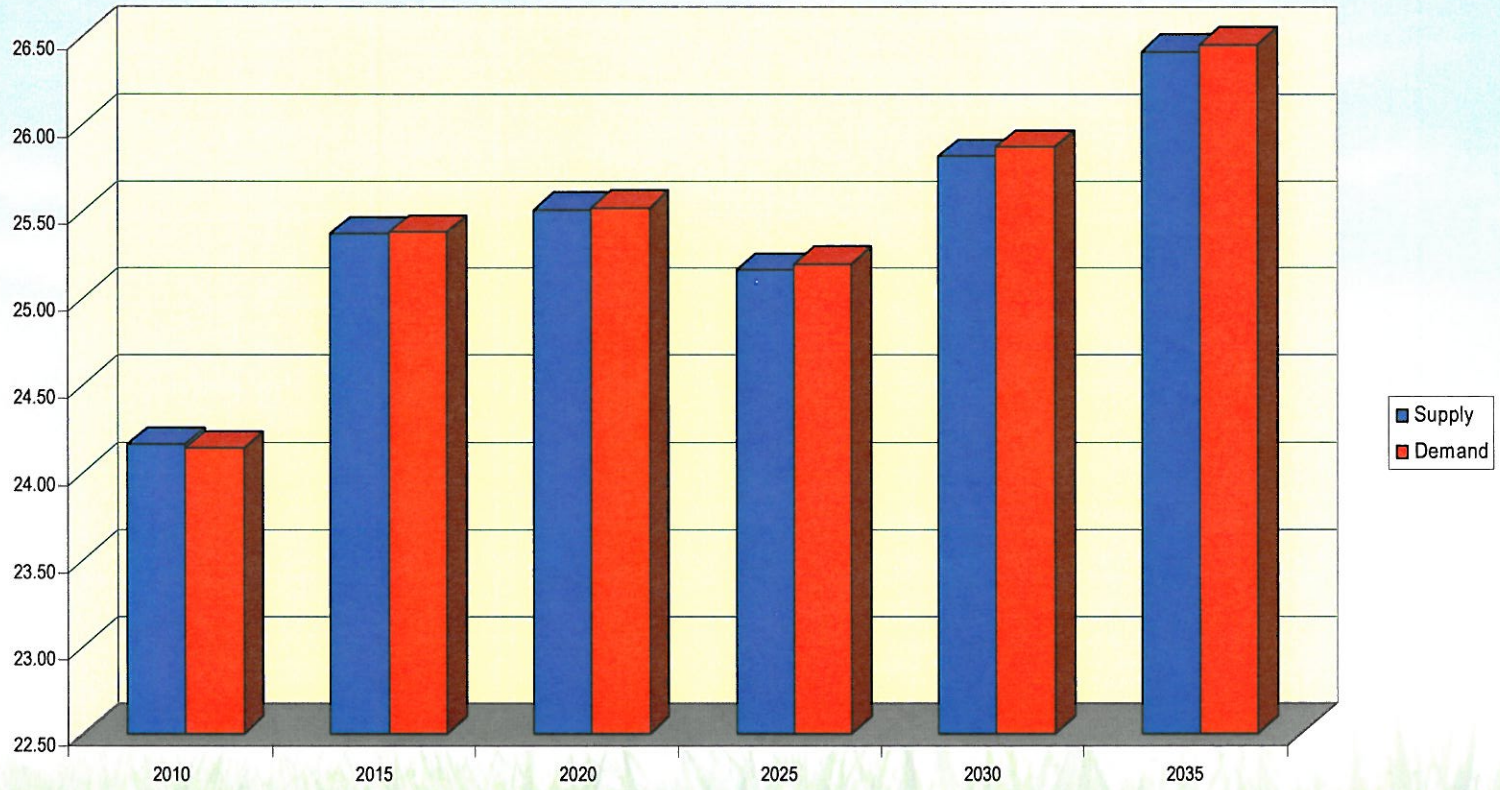
U.S. Supply - Demand 2010 - 2035



Source: EIA Table 13, 2012 Annual Energy Outlook Early Release

- **Supply-demand appears to be tight; most likely if the market is this tight, gas won't be exported – or – drilling will ramp up to cover the deficit**

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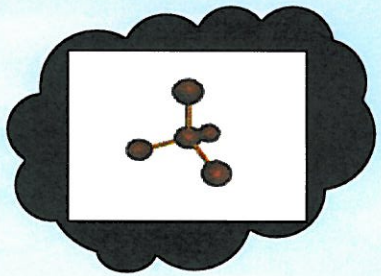
Facts About Natural Gas

- **Natural gas is an inherently clean fuel**
  - Natural gas is mostly methane: CH4
  - (Diesel – C14H30; Gasoline – C8H18; Propane – C3H8)
  - Less NOx, soot and greenhouse gases than petroleum fuels



Methane Molecule

- **Natural gas is very safe**
  - Lighter than air… dissipates when released
  - High ignition temp.: 1000-1100F
  - Air/fuel combustion ratio (5-15%)
  - Colorless, odorless, non-toxic
  - Doesn't leak into groundwater
  - Comprehensive fuel tank, vehicle and station design/mfg codes & standards

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Benefits of NGVs

- **NGVs are proven and reliable**
  - ~12 million NGVs in use worldwide; ~112K on US roads
  - Fleets are best (high fuel use, central fueling, local routes/op. areas)
- **NGVs are quiet**
  - HD NGVs are 80-90% lower db level than comparable diesel
- **NGV life-cycle costs are lower**
  - Fuel costs are far lower! Maintenance costs are =/<
  - Life-cycle cost advantage could improve w/ new federal tax credits
  - 7.2 Gals Diesel = 1 Dth nat. gas
  - 8.0 Gals Gasol = 1 Dth nat. gas

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NGVs Are a "Good Fit" for Fleet Applications

- Local/State Government
  - All Depts.
- Airports
  - Terminal Buses, Hotel/ Parking Shuttles, Taxis
  - Refuse
  - Collection/Transfer
- Transit
  - Buses, Maint. or Supv. Empl.
- School Districts
  - Buses, District or Maint. Empl.
- "Short-Haul" Delivery
  - Food, Bev., Linen Svcs,
- Utilities
  - Gas/Electric/Water/Comm.

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CNG Station Design/Cost Considerations

- **Myth: CNG stations cost $1M**
  - Station costs can range from $15K – $2.5M
  - Anchor fleets (airports, refuse, transit) or 'pooled loads' create economies. (Eliminate "chicken & egg" challenge. Outside-the-fence access adds load.

- **Station Size and Design Considerations**
  - What's needed? Time-Fill, Fast-Fill, Combo Fill
  - Number of vehicles per day, vehicle fueling patterns, max. daily flow, max. hourly flow
  - Available back-up fueling or need for redundancy?
  - Dispensing/Metering/Data Capture/Payment needs?
  - Modular approach adds capacity as fleet grows

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Cargo van for contractor

- GVWR: >8500 and < 14,000 lbs.
  - Ford E-350 cargo van
  - Chevy/GMC 3500 cargo
- MPG: 13/15 City/Hwy, 35K miles/year
- Fuel Use: 8-10 GGE/day; 2700-3100GGE/yr
- CNG Veh. Premium: $15,500
- Life-Cycle Cost Savings (Best Case): $12,400
- Life-Cycle Cost Savings (Worst Case): $8,800
- Simple Payback (Best Case) (Yrs): 2.78
- Simple Payback (Worst Case) (Yrs): 3.19
- Based on 5 yr life and $ 1.80/GGE savings

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School Bus – Contract Provider O&O

- GVWR: >26,000 lbs.
  - Blue Bird All American RE or Thomas Built Saf-T-Liner (both factory-built w/ CWI ISL-G engine);
- MPG: 6.0.- 7.0 / DGE (avg 18,000 mp/yr)
- Fuel Use: 2650 DGE/yr
- CNG Premium: $37,000
- Life-Cycle Cost Savings (Best Case): $31,900
- Simple Payback (Best Case) (Yrs): 7.76
- Based on 13 yr life and 2.00 savings/DGE

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Refuse Truck

- GVW - 26,000+ lbs.
  - Models: Crane Carrier LET, Autocar Xpeditor, Peterbilt LCF 320, Int'l Condor, Mack TerraPro, Freightliner M2, & Kenworth T8SH/T440
  - All with 2010-compliant CWI ISL-G 8.9L 320hp engine
- MPG: 2.5 – 3.0 (lots of idle and PTO time)
- Fuel Use: 35-40 DGE/day; 8500-10,000 DGE/yr
- CNG Veh. Premium: $45,000
- Life-Cycle Cost Savings (Best Case): $123,000
- Life-Cycle Cost Savings (Worst Case): $99,000
- Simple Payback (Best Case) (Yrs): 2.06
- Simple Payback (Worst Case) (Yrs): 2.42
- Based on 8-year life & $2.00 per DGE Savings

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What's Your Fleet's ROI?

ABC Fleet – 40 Vehicles

FUEL SAVINGS Potential

10 Yr. Annualized Est. Fuel Costs Diesel	$6,998,002
10 Yr. Annualized Est. Fuel Costs Gasoline	$0
10 Yr. Annualized Total Est. Fuel Costs Diesel & Gasoline	$6,998,002
10 Yr. Total Gallons Diesel & Gasoline	1,691,360
10 Yr. Est. Cost CNG	$2,663,892
Total 10 Yr. Capital Expenditure	$2,450,000
Est. 10 Yr.Savings w/ CNG	$4,334,110
10 Yr. Annualized Est. Simple Payback w/ CNG	0.28
Rate of Return on Investment	30.67%

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HOW DO WE GET STARTED

- Set Vision – develop a contact strategy
- Develop Plan – identify interested fleets
  - Analyze the Economic Benefits
  - Involve Local Fire Marshalls & City Inspectors, Consult NFPA 30A, 52 & 57.
- Collaboration - form a group, name a fleet champion
  - Policy Makers; Clean Cities; Util. Reps.; Other Fleet Ops.
- Follow Up – knock down barriers

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EXHIBIT
tabbies
B

abundant

domestic

clean

reliable

NGVAMERICA

Natural Gas Vehicles for America

Advocating the increasing use of NGVs where they benefit most.
For the economy. For the environment. For health. For security. **For America.**

NGVs Make the Grade

Schools say next generation of advanced NGVs pass the test, citing improved performance, reliability and durability.

NGVAmerica is a non-profit organization that promotes greater use of natural gas vehicles through outreach, education and technical assistance programs. For more information about this educational supplement or to learn more about how your community can implement an NGV program, contact NGVAmerica at questions@NGVAmerica.org or 202-824-7365. NGVAmerica, 400 North Capitol Street, NW, Suite 450, Washington, DC 20001. www.ngvamerica.org

Advance Fuel Systems Corp (AFSC)
11013 Woodstock Street
Huntley, IL 60142
David G. Chacon, President & CEO
866-725-0801 x704
david_chacon@advancefuelsystems.com
www.advancefuelsystems.com

AFSC designs, manufactures and installs CNG fueling systems using the highest quality products and providing superior customer service. We work with clients to determine their fuel system requirements and budget and then provide safe, reliable cost-effective solutions that meet their needs.

Air & Gas Technologies (AGT), Inc.
42 Industrial Drive
Cliffwood Beach, NJ 07735
Brian Keelen, Vice President, 732 566 7227
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Graham Barker – Sales 203 374 1795
grahambarker@earthlink.net
www.airgastech.com

AGT designs, builds and maintains CNG stations. We have the in-house capability and experience to customize facilities to suit specific customer and site requirements, and we utilize the most appropriate equipment to meet project scope and cost.

American Honda Motor Co., Inc.
1919 Torrance Blvd.. – MS 100-3C-3A
Torrance, CA 90501
Eric Rosenberg, AFV Sales& Marketing
310-781-4457
eric_rosenberg@ahm.honda.com
www.civicgx.com

Honda's Civic GX is fueled by clean, economical, domestically produced natural gas. The GX produces nearly zero emissions and reduces CO2 emissions by 25%. The GX has reduced emissions in fleets nationwide since 1998 while delivering Honda performance, quality, and reliability.

Applied LNG Technologies USA, LLC
5310 Harvest Hill Road – Ste 229
Dallas, TX 75230
Kevin Markey, VP Operations
214-634-6246
kmarkey@altlng.com
www.altlng.com

ALT provides LNG and CNG product and delivery systems. We execute turnkey fuel solutions, including equipment leasing, station installations, safety & training, natural gas production low BTU gas processing, temporary fueling stations, and consulting in the LNG and CNG markets.

ANGI Energy Systems
15 Plumb Street
Milton, WI 53563
Tim Boyle, Business Development
216-832-7645
tboyle@angienergy.com
www.angienergy.com

As a pioneer in the NGV industry and a continuing force in the establishment of CNG refueling technologies, ANGI has built a reputation on delivering solutions that successfully satisfy customer's specific refueling requirements and expectations, independent of size and scope of application.

Natural Gas School Buses

The Right Choice Right Now.

School districts are switching to natural gas school buses. Here are five reasons why.

The favorable cost differential between diesel fuel and natural gas is growing.

While diesel fuel prices have settled down since they spiked up in 2008, they're likely to rebound as the world economy recovers because the underlying fundamental imbalance between oil supply and demand has not changed. The differential between the pump prices of diesel fuel and natural gas, which ranges between 20 and 45 percent, is projected to grow steadily, making natural gas even more economical as we move forward. These cost advantages are expected to continue because of America's abundant domestic supply of natural gas.

Natural gas vehicle technology offers superior environmental advantages.

While school buses are the safest way to transport students, school districts— and the federal government— recognize the importance of reducing students' exposure to harmful diesel exhaust emissions. Natural gas vehicles provide the greatest emission reductions and related environmental benefits of all available alternatives including diesel hybrid technology. And, when used as transportation fuel, natural gas can reduce greenhouse gas emissions by 20–23 percent and 26–29 percent compared with diesel and gasoline fueled vehicles, respectively, according to studies by the California Air Resources Board.

With the abundant supplies of natural gas available here in the United States, school districts across the country are taking a renewed look at the opportunities to save money by switching to natural gas powered vehicles.

Natural gas buses displace dependence on foreign oil in favor of abundant domestic natural gas.

Switching to natural gas displaces an average of 1,800-2,500 gallons of diesel fuel per bus per year, and using NGVs in other school vehicle applications displaces even more. About 98 percent of all natural gas consumed in the US comes from North America, with nearly 85 percent from the lower 48-states and 13 percent from Canada. Enhanced natural gas exploration and production capabilities, especially from coal-bed seams and shale formations, have expanded America's available natural gas resource base to more than 115 years.

Natural gas vehicles save school districts money.

Natural gas bus price premiums are more than offset by fuel and maintenance savings, which means fast payback and substantial life-cycle savings. Federal incentives further improve NGVs life-cycle cost advantage. Private student transportation service providers may take advantage of income tax credits for vehicles and stations directly, while tax exempt school districts may glean the value of these credits through negotiated price reductions from their suppliers who may take the credits. Recognizing the many environmental, energy security and economic advantages, a growing number of states are also adopting incentives to accelerate the transition to natural gas school buses. ■

Advances in NGV technology put natural gas school buses on par with diesel school buses.

Today's natural gas engines use state-of-the-art fuel management and combustion control technology that is generations beyond units first introduced in the 1980s and improved in the 1990s. Current 2010-compliant natural gas school bus engines deliver torque and horsepower similar or better than diesel and use maintenance-free 3-way catalyst exhaust systems without maintenance-intensive particulate filters and DEF systems. Natural gas' low carbon content translates into longer oil change intervals, less engine wear and longer engine life.

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Michael Manning, Dir. of Marketing and Business Dev.
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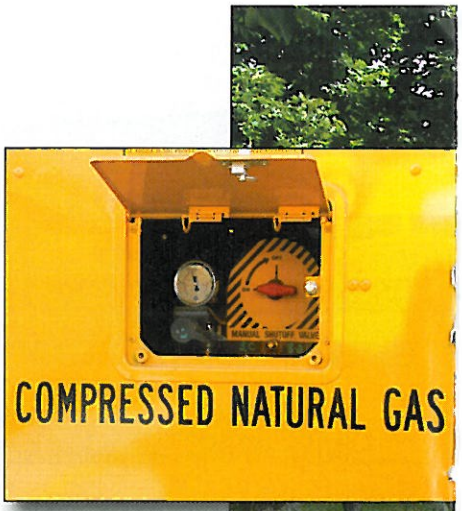
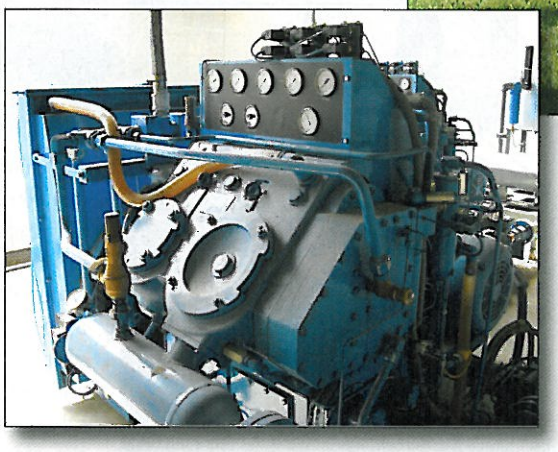
Setting an Example

Leaders Make the Right Choice for Today and Tomorrow





Successful NGV programs are an example for others to follow.

The Los Angeles Unified School District is well on its way to reaching its goal of becoming the greenest school district in the country. The residents of Tulsa School District and the state of Oklahoma know that their jobs and their economy rely on natural gas. And students in drivers' education classes at the Jordan School District outside of Salt Lake City learn that vehicles can run on something other than gasoline and diesel.

These three districts, similar to many others around the country, all have made the commitment to CNG powered vehicles, starting with their fleet of school buses.

Los Angeles Unified School District

Back in 2007, the Los Angeles Unified School District announced its goal of becoming the greenest school district in the country, but its commitment to cleaning up the air started back almost 20 years ago with its first fleet of CNG powered school buses. And that commitment continues today. The district had a fleet of 142 CNG powered school buses in the 2009-2010 school year, already the largest in the country. But that will grow to 402 with its decision this spring to buy 260 new CNG buses from Thomas Built and Blue Bird.

With the new additions, almost one-quarter of the district's 1,300 buses will be powered by natural gas. With an average school bus fuel consumption of about 2000 diesel-gallon equivalents (DGE) a year, the district will be able to displace more than 800,000 gallons of diesel annually.

"We are achieving about a 10 percent savings in fuel costs when comparing diesel per gallon versus per gallon equivalents," says Enrique Boull't, Director of the Transportation Services for the district.

The district serves 678,000 students at 1,044 schools, and upgrading the fleet is a major undertaking, especially when budgets are tight. Just last year, the district estimated that 60 percent of its fleet, which averaged 19.4 years, was in need of replacement. So in moving to upgrade more of its fleet to natural gas, the district once again partnered with the South Coast Air Quality Management District, a Southern California air pollution agency, to help finance the school bus purchases. The South Coast Air quality Management District has been working with the district since 1991 on clean air and healthy breathing initiatives.

"We appreciate our partnership with SCAQMD who continue to help us with the financial challenges of school bus replacement," said Boull't. "LAUSD has the oldest school bus fleet among major urban school districts. Together, our goal is to provide new energy-efficient, lower-emission and safe school buses to our students".

When the district first started using CNG buses, it fueled them at two stations owned and maintained by its local utility, SoCalGas. In 1996, when the California Public Utilities Commission directed SoCalGas to divest most of its stations over the next several years including the ones

Across the country, school districts are improving air quality by switching to CNG. A compressor in the Lower Merion School District, CNG buses in Los Angeles and time-fill in the Jordan School District south of Salt Lake.

operated for LAUSD, the district initiated a fueling infrastructure plan that would meet its current and growing fueling requirements.

The district now fuels its buses at two fueling facilities, one operated by the district and the other operated under an operations and management agreement. LAUSD's first fueling station, which was built in Gardena, has been operated under and O&M agreement with Trillium USA since 2000, and the company it is in the process of upgrading the site so that it can fuel up to 300 buses. The upgrades include 130 new posts for fueling and two 200 horsepower compressors and an additional dryer. The upgrades, which were included in a new five year O&M extension and station expansion contract signed in 2008, are being done at no cost to the school district.

A second smaller station in Sun Valley opened in March 2009 and is operated by LAUSD, "By continually aiming to transition school bus and other heavy-duty diesel fleets to alternative fuel and low-emission vehicles, the District brings a positive and meaningful impact to the air quality for students, staff and the Los Angeles community, " Former Board Member Julie Korenstein said at the time the second station was opened.

Tulsa Public Schools

The people of Tulsa and the State of Oklahoma are very aware of the country's abundant natural gas resources and the jobs it brings to the state, and the district was one of the earliest fleets to convert to natural gas. In 1988, the Oklahoma Department of Commerce asked the district to participate in a two-year pilot program to test the viability of alternative fuels, and the district converted 24 school buses to run on natural gas. With the help of several successful bond issues and zero-interest loans from the state, the district continued its commitment to natural gas. The district then partnered with its local utility, Oklahoma Natural Gas, and, with the help of a grant from the U.S. Department of Energy, it added 40 school buses and 30 medium and heavy duty vehicles. The district has a CNG fueling station on site that has the capability for both timed and fast fill, allowing drivers the opportunity to fill midday if necessary, while most of the buses are typically fueled overnight.

Now the school district, the second largest in Oklahoma, is looking to its second generation of CNG buses to help transport its 41,000 students to its 83 schools. In March 2009, the Tulsa Public Schools announced that it would repower 140 of its buses, about half its fleet, to natural gas in a unique financing arrangement that allows the district to maximize all of the potential incentives. The district has already taken delivery on 66 of these repowered vehicles.

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> **"With diesel fuel above $2 a gallon and CNG way below that, you are automatically going to save money."**
>
> **Ottway Burkholter, Director of Transportation for the Tulsa Public Schools**

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Unable to directly take advantage of the available federal income tax credit, the Tulsa School District entered into a creative financial solution with several partners. Under the arrangement, the district sold its used buses to a Tulsa dealership, which is completing the repowers. NGV Fleet Partners LLC, an Oklahoma based company, which is buying the repowered buses from the dealer and thus eligible for the federal tax credits, is leasing them back to the district and passing on some of the value of the available tax credits in reduced monthly operating lease fees. The district has an option to purchase after five years. Under this arrangement, the district is indirectly receiving some of the value of the credits in lease payments that are lower than if the credits had not been captured.

Jordan School District

Jim Hinckle, Director of Transportation for the Jordan School District just south of Salt Lake City, knows that it was clean air issues—specifically inversions— that influenced his district to switch to natural gas powered school buses years ago. Since deploying them, however, the CNG buses have won the district's praise from top management right down to the bus drivers.

The school district, which was the largest in Utah with more than 270 buses covering more than 250 square miles, was officially split in two a few years ago by forming a new Canyons School District on the eastside. Jordan's fleet of 44 CNG buses was split as well, with 25 going to Jordan and 19 going to Canyons. Since then Hinckle has boosted his fleet by another 10 CNG buses.

"The board is very supportive of our CNG program, even though diesel buses are way cleaner now than they had been," Hinckle says. "We are on our second generation. We started with John Deere engines and when they got out of the business, we switched to Cummins Westport. The one advantage is that the new engines do have a little more torque, which is important."

Similar to many other districts that were early adapters, Jordan started in 1993 by converting school buses to run on CNG. Now the district buys only dedicated CNG school buses and it has other NGVs in its "white fleet." Like other school districts facing a perennial budget squeeze, Jordan has looked for ways to help defray the additional cost of the CNG buses, which Hinckle pegs at about $20 – $22,000. State funding has made a big difference, Hinckle says. The district has worked closely with Clean Cities of Utah to secure support. "Grant support makes a big difference in tight budget times," he says.

The district had operated with four stations, two on the east side and two on the west, and those are now also split with the new Canyons District. Hinckle says the stations have been easy to maintain. Because the district and the community have been so concerned about the air quality, particularly inversions, it has not been as focused on fuel savings, in spite of the differential between the cost of CNG and diesel. The district does, however, save on oil changes. But reducing diesel emissions has been a priority. With the two districts combined running 54 buses on CNG, the district is displacing at least 138,000 gallons of diesel fuel.

Hinckle, a former teacher and principal who took on the job of Transportation Director six years ago, does have some advice for other transportation directors thinking about switching to CNG. First, do some research. "Get information from the vendors who build the buses and the fuel suppliers because infrastructure is very key." Second, sell your techs on CNG. "Make sure that your techs are brought along and trained on CNG, just as you would do on diesel. You have to take a different approach; it's not that CNG engines are difficult to work on, they are just different than diesel." Third, sell your drivers on CNG: "Some drivers prefer to drive a diesel bus because they thing it has better torque but others wouldn't dare to go back to diesel." And last, but not least important, educate your students on CNG. The school district has Honda Civic GXs in its fleet of driver training cars, and students learn about CNG vehicles through a curriculum developed in coordination with Clean Cities of Utah. "The kids are very much aware," says Hinckle.

Lower Merion (PA) School District

When suburban Philadelphia's Lower Merion School District made the decision to switch from diesel to natural gas school buses fifteen years ago, the people who lived nearby couldn't have been happier. Residents of the upscale neighborhood adjacent to the bus lot at Lower Merion High School had complained about the gray clouds of diesel exhaust that would drift through their area each morning. Aware of the environmental and energy security advantages of CNG buses and looking to stay ahead of potential mandates and emissions requirements, the board directed the district's fleet director to start transitioning to CNG.

"Unlike other transportation directors who have to convince their school boards to switch to natural gas, the policymakers came to me and said we were going to make the switch," says Michael Andre, Supervisor of Transportation.

Andre did his homework, investigating CNG bus options and fueling station requirements and coordinating with his local Clean Cities Coalition to research available federal and state grants. In 1996, Andre took delivery of his first 20 CNG Blue Bird All American RE buses and commissioned his first CNG fueling site, one of two fast-fill stations the district now operates. Lower Merion used Pennsylvania Alternative Fuel Incentive Grant (AFIG) funding to offset some of the buses' incremental cost and pay part of the station development cost.

The district's commitment to natural gas has never wavered. Over the next decade, Andre used district funds supplemented by Clean Cities grants and AFIG grants to grow his CNG school bus fleet to more than 70, making it one of the nation's largest and the largest on the East Coast. The district still keeps a few diesel buses in its fleet for special education routes and long distance class trips

and extracurricular activities out of the region.

In 2000, when Andre placed buses on routes serving Harriton High School on the district's west side, he added the second fueling site there, again using supplemental grant funding. "The grants help us continue to do what's right for our environment and community," says Andre. The buses each fuel in about 10-15 minutes after making their morning runs, transporting 6,900 students to six elementary schools, two middle schools and two high schools during the school year, with continuing programs in the summer.

Andre notes that his mechanics have learned a lot about their CNG buses and stations and that there were "bumps" along the way but that his team has become proficient and comfortable with NGV technology. "There is a learning curve, but if you have an in-house shop with capable mechanics, they can learn the technology in short order. You're still talking about the internal combustion engine," says Andre.

> **"I don't think the district would accept going back to exclusively diesel."**
>
> **Michael Andre, Supervisor of Transportation, Lower Merion School District outside of Philadelphia**

As an award winning NGV advocate, Andre is proud that the district's fleet has traveled nearly 10 million miles using natural gas. "That's a boat load of displaced diesel," he says, adding that his fleet now displaces nearly 175,000 gallons of diesel, a number that will grow when nine additional CNG buses arrive this summer. And his advice to other school districts? "It's a confidence thing," he says. "People think that it's an exotic fuel and they really need to have some confidence that it's every bit as practical as diesel."

"I don't think the district would accept going back to diesel," says Andre. In fact, four years ago the U.S. Department of Energy cited Lower Merion as "Pennsylvania's primary success story for alternative fuels." ■

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Fill'er Up

Options for fueling school buses and other fleet vehicles.

With buses returning to a central spot, districts can opt for time-fill while some find more flexibility with fast fill.

On-site or offsite

Making the switch to natural gas vehicles is made easier when there is public access fueling nearby including stations operated by the local gas company, a retail fuel provider or another public or private fleet. When evaluating this option, it's important that you check with the station owner to make sure their equipment is capable of accommodating the additional load. As noted below, fleet fueling patterns are a critical consideration in this assessment. Another consideration is the proximity of the station to the central bus depot(s) or to the bus routes and the convenience and cost of driver time spent traveling to and from an offsite fuel site. If use of existing fueling infrastructure is not practical, convenient or economical, it may be better to build a new station on-site or nearby. This may be accomplished several ways.

One option is to contract design and construction of a station and then retain ownership, operations and maintenance responsibility. While this option may offer the promise of greatest savings, it also incurs the greatest risk. For low volume applications, this is likely the only option available if existing fueling infrastructure is not available.

Another option is to completely delegate station development, ownership, operations and maintenance (O&M) to an experienced natural gas fueling provider. This option tends to be available only to districts using larger volumes of fuel and typically entails entering into multi-year contracts for fuel and services. The minimum contract volume requirement likely will be influenced by the number of other stations that provider operates in the area, whether the contract allows for "outside the fence" retail or contract sales to others, and the number of other existing and potential NGV customers in the area.

Still another option is to build and retain ownership but contract O&M to a third party with experience and expertise. This option also tends to be available only to larger volume customers and usually is charged on a monthly fee, fee-per-GGE assessment or some combination of the two.

Large school districts that have transitioned their fleet to CNG, or those that are in the process of doing so, usually select one of these latter two options. By retaining locally-based skilled NGV station technicians on staff and stocking critical components in inventory, independent natural gas fuel providers and O&M companies are better positioned to handle this task, allowing school district fleet managers to focus on their core responsibilities.

Fast-fill Versus time-fill

School districts that elect to fuel their CNG vehicles on site may choose fast-fill systems, time-fill posts or a combination of both. Fast-fill CNG stations offer the convenience and flexibility of fueling as quickly as with liquid fuels like gasoline or diesel. Most school district fast-fill stations employ a combination of compressors coupled with stationary high-pressure steel storage vessels. Using multi-stage compressors, natural gas is boosted from the lower pressure delivered by the local gas utility up to 4000-5000psi. When the fuel hose is connected to the vehicle and the ANSI Weights & Measures-approved dispenser is activated, gas flows from the higher pressure storage vessels to the vehicle's onboard cylinders. The rate of dispensing and the total amount of available fuel is a function of the pressure differential, the number of vehicles fueling at one time from the same storage bank and the control sequencing of the compressor. Your design consultant will work with you to come up with the right combination of compression and storage.

While fast-fill CNG stations provide fueling capability similar to gasoline and diesel dispensing rates, fleets that return to central depots for extended periods such as overnight or long mid-day breaks in service - such as school bus fleets, may find time-fill fueling systems more attractive. These systems, which refuel vehicles' onboard storage cylinders at slower rates, are considered the most efficient and economical because they do not require as much compression capacity as a fast-fill system, nor do they require on-site CNG storage nor ANSI-approved dispensers. The rate of fuel transfer will depend on the size of the compressor and number of vehicles fueling at any one time, but may be as little as one GGE/hour to as much as five or six GGE/hour. In time-fill applications, drivers connect their vehicle to the automated system and walk away, whether returning later that day for additional runs or the next morning to start the day anew. The fueling apparatus automatically shuts off when the vehicle's fuel cylinders are full. The automated nature of time-fill fueling reduces as much as 15 minutes of labor time per driver per day.

Design considerations

School districts that opt for on-site fueling should work with experienced CNG station design consultants who can help them identify their requirements, assess options to modi-

Fueling Options

fy existing fueling operations and then select the best option that meets their needs and their budgets. These services may be contracted through an independent CNG station design engineering consultant who may handle the process from design through station commissioning, or they may be provided by the engineering staff of a CNG equipment packager.

Regardless of the station development process you choose, you can facilitate the process by having information available about your fleet's fueling needs and your potential fueling site(s), including the following:

Vehicle Fueling Requirements

How many vehicles need to fuel each day and what is the average and maximum amount of fuel used by each vehicle? What are the available fueling windows of each vehicle and is this able to be managed? Will there be full- or limited-public access by other fleets and what is the projected transient use by these additional vehicles? Is there back-up fueling capability nearby in case of planned or unplanned equipment downtime and how does this affect equipment redundancy requirements? Armed with this information, you and your design consultant can calculate projected total daily fuel requirements and maximum hourly flow rates, which will determine the type of station required, the amount of compression needed, whether storage is required and— if so— how much, how many and what type of dispensers will be required.

Fueling Site Information

What is the volume and pressure of gas available to my site and what are the minimum and maximum inlet pressures I may expect delivered to my compression equipment? What is the moisture content of the gas? What is the available electric service on site and will I need to upgrade it to meet my compressor motor needs? Where are my utility services located on site and is my site plan up to date? Which building and construction codes apply in this area and what permits and/or approvals will I need? What is the amount of space and the optimum footprint for my equipment and fueling island(s)? What are the vehicle ingress/egress issues— if any? How will future expansion of this site potentially affect my plan?

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Operating Budgets

"Show Me the Money"

Tax incentives and grants stretch school district budgets.

NGVs reduce operating expenses and provide substantial life-cycle savings, but the additional upfront capital to cover vehicle price premiums and— for districts located in regions not yet served by a robust CNG network— installation of fueling infrastructure, can derail programs from moving forward. Here's a recap of several federal programs that have provided school districts millions of dollars to help pay for new school buses and save money on fueling them.

Excise Tax Credit for Fuel

In 2005, Congress passed the Safe, Accountable, Flexible, Efficient Transportation Equity Act (SAFETEA-LU, often referred to as the "Highway" or "Transportation" Bill), which provides a 50-cent motor fuels excise tax credit to the seller of each gasoline-gallon-equivalent (GGE) of compressed natural gas (CNG) or gallon of liquefied natural gas (LNG). The 50-cent incentive is provided to businesses, individuals, and *tax-exempt entities*— including school districts— that sell or, in some cases, use the fuel. The fact that the incentive is referred to as a tax *credit* initially created some confusion about the ability of tax-exempt entities to claim the incentive. The term "rebate" might better describe the credit as it applies to tax-exempt entities.

IRS guidance says the credit belongs to the entity that owns the CNG or LNG as it is dispensed into the vehicle. For retail transactions, the credit goes to the seller, even in the case of sales to tax-exempt entities. If the CNG or LNG is dispensed at a user's private fueling station, the credit generally goes directly to the user of the fuel, assuming they own the natural gas, regardless of their tax status or whether they contract with a third party to operate and maintain their station.

This means that school districts that have their own refueling site are eligible to receive a 50-cent rebate from the federal government, and school districts that buy their fuel at another location— or from a retailer operating a station on their property— benefit from the lower price because the seller receives the tax credit or rebate.

Furthermore, the credit applies to all sales, including those to other public and private entities that may choose to fill up there. In these cases, the federal motor fuels excise tax of $.183 per GGE of CNG would apply to sales to taxable entities. The motor fuels excise tax payment and credit process is simple, requiring minimal quarterly filing to receive the net rebate check. Some school districts have used these outside sales to other entities as a revenue generator.

This tax credit expired at the end of 2009 but the expectation is that Congress will reinstate this credit retroactively before the end of the 2010.

Income Tax Credit for Infrastructure

The Energy Policy Act of 2005 provided an income tax credit for the cost of installing new natural gas refueling equipment in order to encourage the expanded development of natural gas refueling stations, increase use of natural gas as a motor vehicle fuel, and reduce demand for petroleum motor fuels. The law originally

Vehicle Weight Categories & Incremental Cost Caps (ICC):

Weight	ICC	50%	80%
Under $8,501 lbs:	$ 5,000	$ 2,500	$ 4,000
8,501 to 14,000:	$ 10,000	$ 5,000	$ 8,000
14,001-26,000:	$ 25,000	$ 12,500	$20,000
More than 26,000	$ 40,000	$ 20,000	$32,000

provided for a maximum credit worth $30,000 or 30 percent of equipment costs. The American Recovery and Reinvestment Act of 2009 increased that to $50,000 or 50 percent of the cost, whichever is less, for installations completed in 2009 and 2010.

The credits cover the cost of acquiring equipment that is used to dispense qualified alternative fuels such as CNG or LNG into a motor vehicle. This includes compressors, dryers, controls, on-site storage vessels, dispensers, fuel management systems and related equipment.

So how can this help school districts that are tax-exempt? If the infrastructure is acquired by a tax-exempt entity, the company that sold the fueling equipment can claim the tax credit— but only if they provide the customer with written notification of the credit's value. The seller may— but is not required to — pass along any savings associated with the tax credit.

While this law expires at the end of 2010, efforts are underway to ensure that these incentives remain or are increased as the county works to both improve the air quality and reduce its reliance on foreign sources of oil.

Income Tax Credit for Vehicles

The Energy Policy Act of 2005 provides an income tax credit for businesses and individuals that acquire a "new," dedicated alternative fuel vehicle. Generally, vehicles previously powered by petroleum fuel (gasoline or diesel) that are subsequently retrofitted or repowered to run on natural gas are considered "new natural gas vehicles." In order to qualify for the incentive, a person or business must be a taxpayer.

So how can school districts benefit from this provision if they are not taxpayers? If the NGV is sold to a tax-exempt entity, the company selling the vehicle can claim the tax credit but only if the customer is provided written notification of the credit's value. The seller may— but is not required to— pass along any savings associated with the tax credit. The seller's tax liability and/or alternative minimum tax (AMT) will factor into whether a price discount may be available to pass back to the tax-exempt entity.

The tax credit values are tied to a percentage of the allowable incremental cost caps, which range from $5,000 to $40,000 depending on the gross vehicle weight rating of the vehicle. Depending on the emissions performance of the vehicle, the tax credit is worth 50% or 80% of the incremental cost— or conversion cost— of the vehicle, which, in the case of

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john@naturaldrive.com
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NaturalDrive offers a line of dedicated CNG vehicles retrofitted using our proprietary EPA- and CARB-certified OEM-style engine retrofit systems which are fully OBD II-compliant and use plug-and-play technology with no under-hood wiring modifications, and lightweight carbon fiber fuel cylinders

continued from page S-11

Type C and D school buses is worth $20,000 or $32,000. Because they are so clean, natural gas-powered school buses typically qualify for the full $32,000 credit. (see chart).

Grants Reduce Initial Costs

Federal and/or state grants that offset or reduce upfront costs can make the difference between alternative fuel projects that move forward and those that stall, despite favorable life-cycle savings. In the accompanying sidebar is a short summary of several federal grant programs that have been successful in helping school districts implement natural gas projects.

In addition, many states have grant programs that are similar to— or supplement— these federal programs. School administrators are encouraged to stay abreast of available funding and grant solicitation guidelines and timetables by connecting with the local Clean Cities Coalition; regional EPA Diesel Emissions Reduction Collaborative; state energy, environmental and economic development agencies; local/regional air quality council; and other allied clean-air/clean transportation organizations. The US DOE Clean Cities' Alternative Fuel & Advanced Vehicles Data Center (AFDC) tracks many of these incentives at http://www.afdc.energy.gov/afdc/laws/state ■

Grant programs help fund school fleets

■ ***US EPA Clean School Bus USA Program*** – This program, which is presently funded under the Diesel Emissions Reduction Act (DERA) and part of what is more commonly known as the "National Clean Diesel Program," targets reduction of diesel emissions through a variety of strategies. This includes grants to repower diesel school buses with clean natural gas engines, and grants for early replacement of older diesel vehicles with newer, cleaner ones powered by natural gas. Current grant program guidelines allow for 75% of the cost of repowering an existing bus and up to 50% of the cost of a new school bus replacing an older one as long as the engine meets 2010 engine standards. More information is available at: http://www.epa.gov/otaq/schoolbus/funding.htm#2009

■ ***US EPA Supplemental Environmental Projects (SEP) Program*** – SEPs are environmentally beneficial projects that a defendant in an environmental enforcement action agrees to undertake as part of a settlement. While not specific to school district applications, a number of school districts have successfully secured SEP funds for diesel emission reduction projects including natural gas repower and replacement programs. Each SEP project is unique and typically is negotiated between the alleged offender, the regional EPA office, state and/or federal justice departments and the grant benefactor(s). Local non-profit clean-air advocacy organizations may also become involved in coordinating and implementing the grant and measurement and reporting mechanisms. More information is available at: http://www.epa.gov/compliance/civil/seps/

■ ***US DOE Clean Cities Program*** – This program advances adoption of practices that reduce petroleum consumption through a network of approximately 90 volunteer coalitions, which develop public/private partnerships to promote alternative fuels and advanced vehicles, fuel blends, fuel economy, hybrid vehicles, and idle reduction. Clean Cities grants have been applied to the numerous NGV projects including covering all or part of the incremental costs of CNG school buses and other NGVs, and also toward investment in fueling infrastructure, especially if that fueling infrastructure includes a public access component, thus furthering broader alternative fuel availability. More information is available at: http://www1.eere.energy.gov/cleancities/

■ ***US DOT Congestion Mitigation and Air Quality Improvement (CMAQ) Program*** – The CMAQ program funds transportation projects that contribute to attainment or maintenance of the national ambient air quality standards (NAAQS) while simultaneously reducing traffic congestion and its negative economic impacts. Typically, these funds are allocated based on population and NAAQS status, and distributed to a state's Department of Transportation for further allocation to local/regional metropolitan planning organizations (MPO). While states may apply more restrictive guidelines, CMAQ grants generally are applicable to NGV program implementation including vehicle and station costs, and they must have 20% local or regional (non-federal) co-funding. More information is available at: http://www.fhwa.dot.gov/environment/cmaqpgs/06guide.htm#progpurp

■ ***US DOE Energy Efficiency and Conservation Block Grant Program*** – This program assists cities, counties, states, territories, and Indian tribes in developing, promoting, implementing, and managing energy efficiency and conservation projects. While most energy block grant funds are allocated to building efficiency improvements, transportation projects are eligible under federal guidelines and several states have allocated a portion of their funds for alternative vehicle and fuel projects. States have the final determination about project eligibility and co-funding guidelines. More information is available at:http://www1.eere.energy.gov/wip/eecbg.html

America's Fuel

Hundreds of public and private fleets and thousands of consumers across North America rely on NGVs every day and more are joining the trend, due - in part – to recognition that we have vast natural gas resources here and in neighboring Canada. In fact, more than 98 percent of the natural gas consumed in the US is produced in North America, and new discoveries and improvements in exploration and extraction technology will continue to grow our supply well into the future.

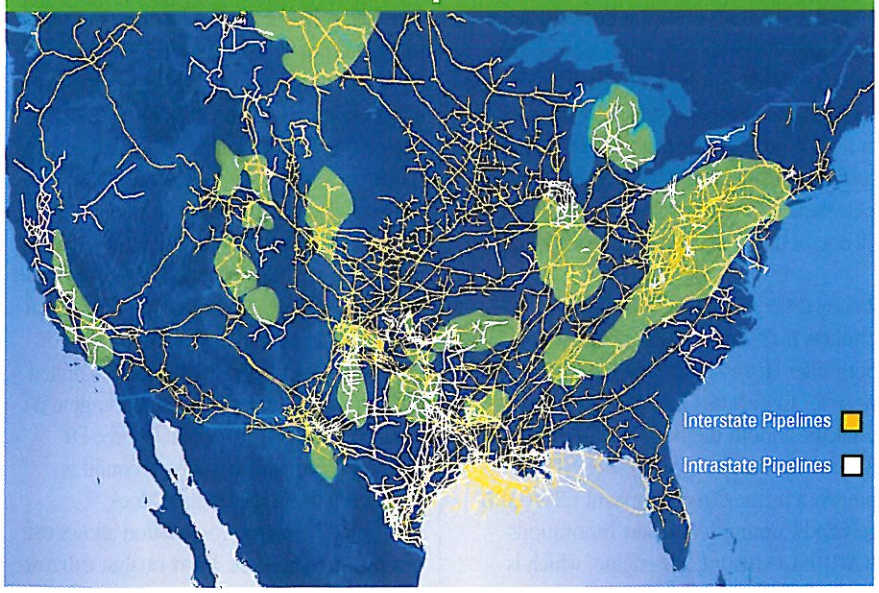
When experts talk about the America's natural gas supply and the opportunity it presents, they use words like "unprecedented" and "an energy revolution," making this the perfect time to use more of this domestic resource as a transportation fuel. In 2009, the Potential Gas Committee reported an unprecedented increase in the magnitude of natural gas deposits in the United States. The PGC— an independent non-partisan group of geologists, economists and natural resource experts considered the most authoritative voice on natural gas supply— publishes the biennial report to provide industry and policymakers a reasonable appraisal of America's potential natural gas resource.

The newest finds have been on land, where natural gas is being produced from shale rock formations. Natural gas is now being produced from shale formations found in Louisiana, Texas, Arkansas, the Rocky Mountains and an areas stretching from West Virginia through New York.

The committee's conclusion: the country has at least a 100-year supply of natural gas using the technology we have today. The United States consumes about 20 trillion cubic feet of gas a year, and the Potential Gas Committee conservatively estimated that the country has a total available future supply of 2,074 trillion cubic feet of gas. More Less conservative estimates put that supply well over 150 years.

According to the U.S. Energy Information Agency, 321,860 million cubic feet of natural gas— is used in vehicles in this country. Even if the number of NGVs were to increase 100-fold in the next 10 years to 5 percent of the entire vehicle market, the impact on natural gas supplies would be very small. ■

Shale Basins and the U.S. Pipeline Grid



NexGen Fueling
Div of Chart Industries
407 7th Street N.W.
New Prague, MN 56071
James Turvey, Business Development
512-868-0467
James.turvey@chart-ind.com
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NexGen Fueling provides all the equipment needed for LNG Fuel Stations and Vehicle Fueling. From the distribution to the on-board fueling system, we have the innovation, performance, and experience to make your system integrate seamlessly. When you choose Chart's NexGen Fueling, you get single-source accountability for your entire LNG system. NexGen Fueling is a group of Chart Inc.

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NGV Motori, USA provides a complete turnkey conversion solution for all its clients. From Prototyping to getting certifications, to aftermarket servicing, NGV Motori is well positioned to be a leader in the US as it has been globally.

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SSP Fittings Corp designs & produces hydraulic & instrumentation tube fittings and valves made from stainless steel, Monel®, brass and other exotic alloys. SSP is a world leader in high-quality NGV and CNG station components and tube fabrication assemblies.

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SCI has over 50 years experience in the manufacture of composite pressure vessels for natural gas vehicles, hydrogen storage systems and bulk gas transport.

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Swagelok provides products and services to support the design and production of natural gas vehicles, filling stations, and hydrogen fuel cell technology.

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Jennifer deTapia, Director of Market Services
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Trillium builds and operates Compressed Natural Gas fueling stations nationwide. Reliable equipment, comprehensive maintenance programs and competitive pricing make our stations the easy and economical way for fleets to meet clean air requirements.

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mikecerven@altecheco.com
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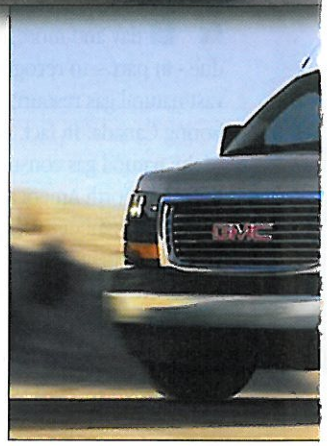
TransEco & Aletch-Eco provide CNG station development and O&M services, certify CNG conversion systems with the EPA as a small volume manufacturer, and operate a state-of-the art facility for converting light-, medium- and heavy-duty vehicles to operate on natural gas or propane (dedicated, bi-fuel and diesel re-powers).

Operating Budgets

NGVs For Every Need



School district fleet managers rely on a wide variety of vehicles every day, from sedans, pick-ups and vans for their central administrative and maintenance personnel to school buses to take students to and from school and extracurricular activities. For every need, there is a natural gas vehicle available to get the job done.

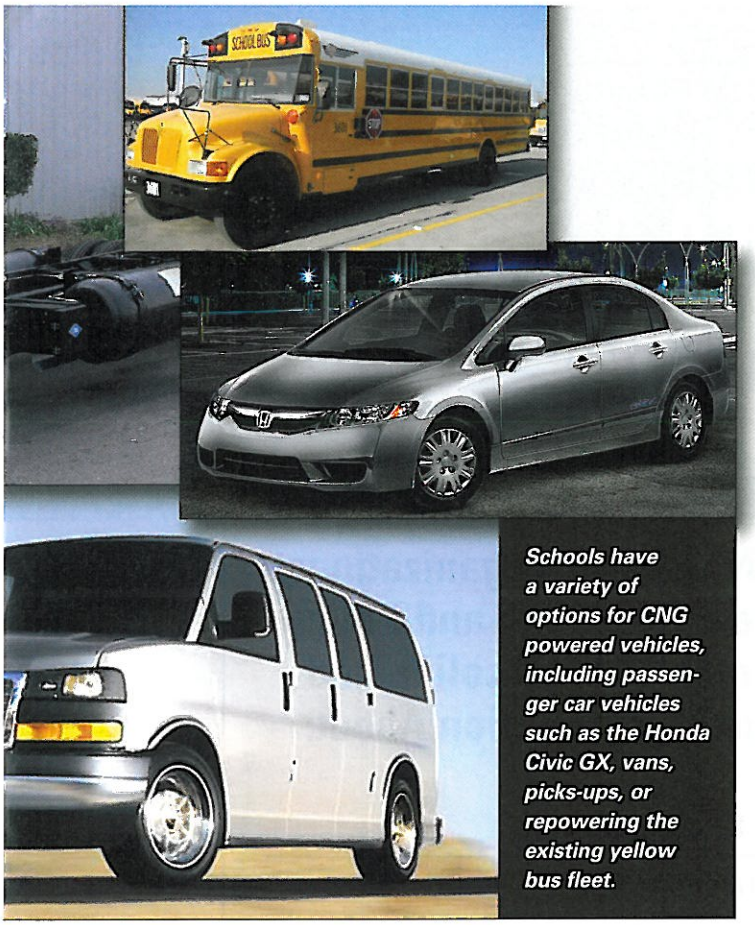
NGVs are available from original equipment manufacturers (OEMs) and also from Small Volume OEMs (SVMs), which are often referred to as "conversion" or "retrofit" companies. Both OEMs and SVMs submit their engines and vehicles to the Environmental Protection Agency (EPA) and/or California Air Resources Board (CARB) for emissions compliance testing and verification – thus earning a Certificate of Conformity to strict environmental regulations ensuring that vehicles are clean and will remain that way throughout their useful life. While OEM's such as Thomas Bus and Blue Bird install natural gas engines in their vehicles at the factory, EPA- and CARB-certified retrofit or repower systems are typically handled by the SVM or, more commonly, by one of their qualified full service installers.

School Bus Options

Thomas Built Bus and Blue Bird Corporation both offer factory-built Type D (Type 4) "transit style" CNG buses in a variety of seating capacities. Both the Blue Bird All American RE and Thomas Built Saf-T-Liner HDX are powered by the 2010-compliant EPA-/CARB-certified Cummins Westport Innovations (CWI) ISL-G natural gas engine, which is available in two configurations for school bus applications: 250 HP/730 ft-lb torque and 280 HP/900 ft-lb torque. The ISL-G is a spark-ignited stoichiometric combustion engine that uses cooled EGR.

Repowering a bus is an option that appeals to school districts looking to save money while garnering additional life out of their existing fleet. In these applications, it's important to match engine HP/torque configurations with appropriate transmissions and ancillary systems. Emissions Solutions Inc. (ESI) offers their EPA-/CARB-certified Phoenix 7.6L NG, a 2010-compliant stoichiometric natural gas repower option for IC Bus Type C (Type 3) "conventional style" and Type D buses equipped with Navistar's DT466 engine (pre-2007) or Maxx Force DT engine (2008-present). ESI's Phoenix uses the Navistar block as the base platform, retaining the same bore and stroke and modifying the top end, resulting in a spark-ignited non-EGR engine of very similar HP/torque profile that may be installed in the same footprint. For DT466 repowers, the older engine is pulled and a completely remanufactured engine is installed in its place. For Maxx Force DT repowers, an in-place top-end rebuild is completed using the original block.

Stoichiometric combustion allows use of a maintenance-free 3-way catalyst exhaust



Schools have a variety of options for CNG powered vehicles, including passenger car vehicles such as the Honda Civic GX, vans, picks-ups, or repowering the existing yellow bus fleet.

system (much like that found in passenger cars). This is in contrast to today's diesel buses, which require maintenance-intensive diesel particulate filters and selective catalytic NOx reduction (SCR) systems that utilize diesel emission fluid (DEF, a urea-water solution), injectors and on-board storage. Both Blue Bird and Thomas Built offer a variety of CNG fuel storage capacities to meet range requirements from rural to urban applications.

Other district fleet vehicles

School districts have lots of options beyond the yellow school bus to go green. Whether used for driver education programs or for central district administrative, healthcare, social service and maintenance personnel, available vehicles include:

School district fleet managers are encouraged to reference *"Available Natural Gas Vehicles and Engines,"* a regularly updated online document posted on the NGVAmerica and Clean Vehicle Education Foundation websites (see back cover) and/or contact these manufacturers directly for more information concerning availability of EPA and CARB-certified engines and retrofit systems, applicable model years and installation services. ■

CNG options go beyond the yellow bus

Sedans and SUVs

- Honda: Civic GX
- Ford/Lincoln/Mercury: Focus, Fusion/Milan; Crown Victoria/Grand Marquis/Town Car; Expedition/Navigator; and Transit Connect
- GM: Chevy Impala; Chevy Malibu /Buick Lucerne/Pontiac G6; Chevy Tahoe/GMC Yukon; Chevy Suburban/GMC Yukon XL

Vans

- Ford: E-series 150, 250, 350; and cutaway 350 and 450
- GM: Chevy Express/GMC Savana 1500, 2500 and 3500; cutaway G4500

Pick-ups and Class 3-5 work trucks

- Ford: F-series 150, 250, 350, 450, 550
- GM: Chevy Colorado/GMC Canyon; Chevy Silverado/GMC Sierra 1500, 2500 and 3500
- Isuzu (w GM engine): NPR and NPR HD cab-over
- Workhorse (w GM engine): W42 and W62 step-van

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Tom Sewell, President
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Tulsa Gas Technologies is a manufacturer of CNG dispensing equipment, metering devices, sequencing panels and provers; compressor and compressor part sales.

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Xebec Adsorption, Inc., specializes in the engineering, design and manufacturing of compressed air and natural gas dryers with associated filtration equipment and instrumentation for use in CNG stations.

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Zeit Energy provides Consulting & Education; Design, Engineering, Build of Fueling Stations; Maintenance Contracts; Leasing and Fractional Ownership Arrangements for CNG Fueling stations. Our customers are Municipalities, Universities, and Private Fleet Owners nationwide.

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Nationally Recognized Non-Profit Organizations Dedicated to Helping Fleet Operators and Policy Makers Evaluate Alternatives to Gasoline and Diesel, Providing Accurate Information About:

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- Comparative Power and Performance Data
- CNG, LNG and L/CNG Fueling Station Development, Design and Operations & Maintenance Options
- Economic Analyses
  - Purchase Costs
  - Operation & Maintenance Costs
  - Simple Payback and Life-Cycle Savings
- Legislative and Regulatory Information
  - Federal and State Tax Incentives and Grant Programs
  - Emissions Compliance Guidance
- Vehicle and Fueling Station Technology Safety, Codes & Standards and O&M Best Practices
- Market Analysis, Program Implementation and Technical Education

Relied on by federal and state agencies, fleet organizations and clean-air / clean-transportation advocates as the expert resource. Visit us at:

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CLEAN VEHICLE EDUCATION FOUNDATION

Why Natural Gas as a vehicle fuel?

abundant

America has 100-plus years of Natural Gas reserves available to meet our energy needs.

domestic

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clean

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reliable

People have enjoyed the benefits of safe, reliable Natural Gas for more than 100 years.

Natural Gas Vehicles

A perfect fit for interests big & small

More than 25 manufacturers produce 100 models of light-, medium- and heavy-duty natural gas vehicles and engines in the U.S.

One-in-five (20%) of all new transit buses on order nationwide are fueled with natural gas.

Perfect for Fleets

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- Buses, maintenance, supervisors

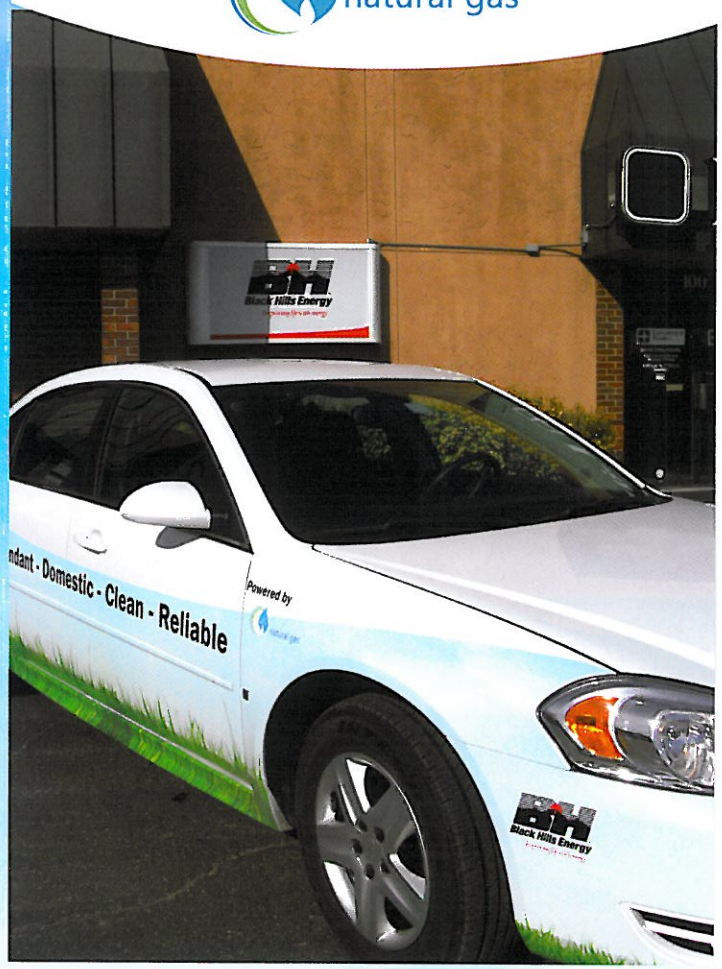
School Districts
- Buses, district personnel, maintenance

"Short-haul" delivery
- Food & beverage, port-rail, linen services

Utilities
- Gas, electric, water, communications

Take advantage of what NGVs offer you. Learn how easy it can be with our help. See contact information on other side.

natural gas



Powered By Natural Gas

Improving life with energy

Black Hills Energy

natural gas

Environmental Benefits

Natural Gas Vehicles are cost efficient, safe and cleaner running than gasoline or diesel powered vehicles.

- Per unit of energy, natural gas contains less carbon than any other fossil fuel.
- Tests have shown that, compared to gasoline and diesel vehicles, NGVs reduce greenhouse gas emissions by 22-29 percent.

Commercial Fleet Operators

- There are more than 110,000 NGVs in the United States and 12 million worldwide.
- With 90 percent of our natural gas produced here in the United States, NGVs reduce our dependence on foreign oil.
- A natural gas refuse truck displaces 35-40 gallons of diesel fuel a day.
- Take advantage of 1.5 million miles of reliable U.S. natural gas infrastructure.

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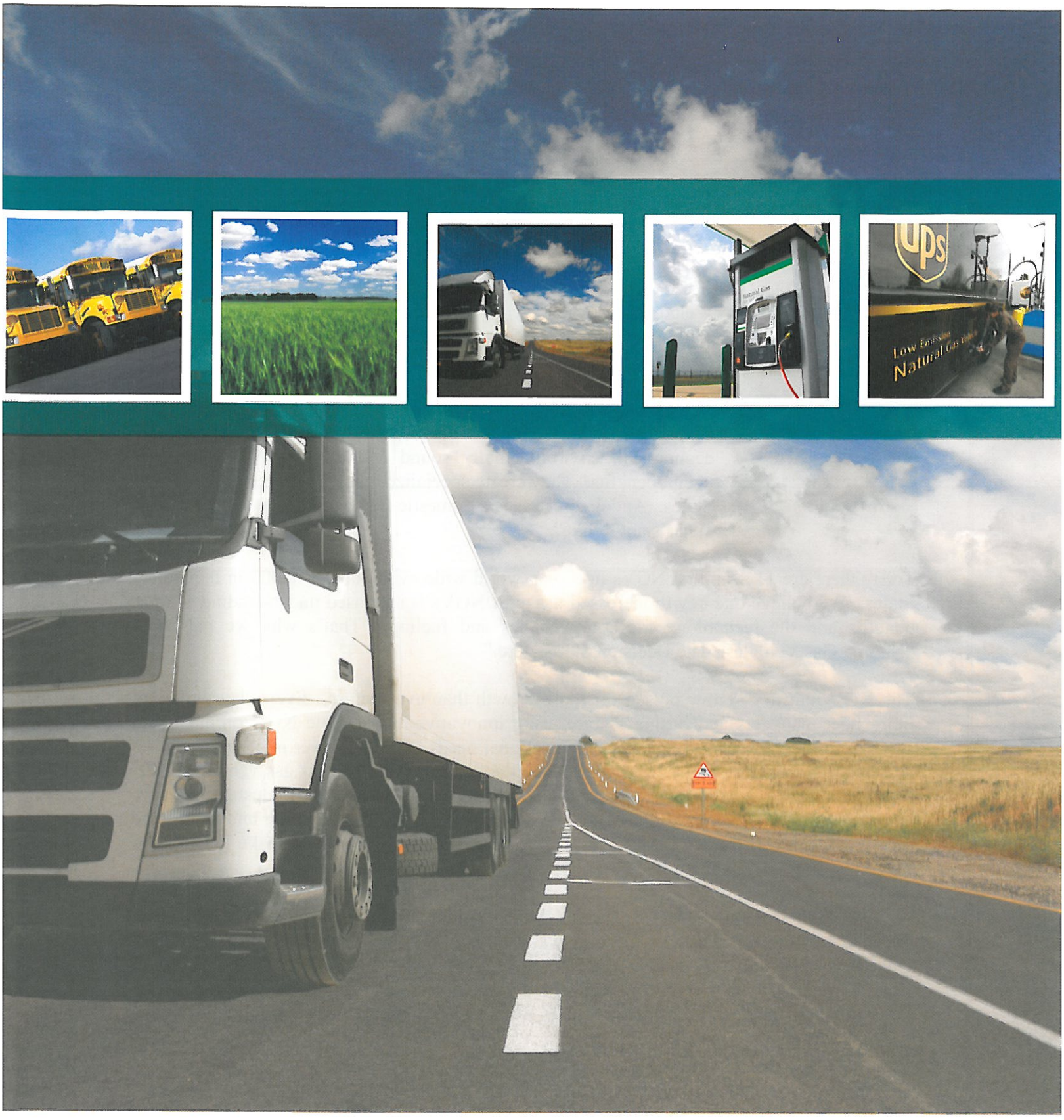
Natural gas prices are stable and predicted to stay that way for the foreseeable future. Where will gasoline prices be in a month? A year? What plans do you have in place to manage your budgets when facing higher fuel prices?

- Natural gas is sold in GGEs (gasoline gallon equivalents) or DGEs (diesel gallon equivalents)
- On average, drivers today save between $.75 and $1.25 per GGE/DGE at the pump.
- Natural gas has been 25-42 percent cheaper than diesel per DGE over the past 14 years.
- Federal rebates are available for qualifying NGV and fueling infrastructure purchases.

Contact Your Black Hills Energy Natural Gas Vehicle Expert:

Tim Hess
2330 N. Hoover Rd.
Wichita, KS 67205
Office: 316-941-1653
Cell: 316-734-1983
tim.hess@blackhillscorp.com



Natural Gas Vehicles:

The Decision Starts Here

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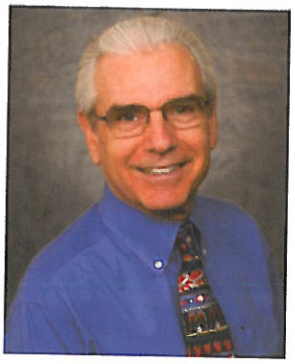


Welcome to "Natural Gas Vehicles: The Decision Starts Here," a comprehensive, easy-to-understand publication highlighting the use of natural gas as a transportation fuel.

The facts speak for themselves. Natural gas vehicles (NGVs) have advantages over gasoline and diesel powered vehicles: they're safe, economical, environmentally sound and they provide significant health benefits. They create specialized jobs right here in the United States. And natural gas is a domestic fuel that is abundant in supply. What's not to like?

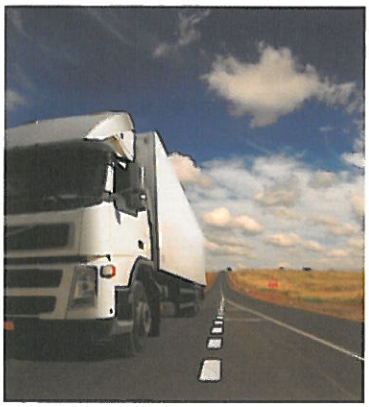
Today there are 11.2 million NGVs operating world wide, with about 140,000 in the United States. We believe one key to increased usage of NGVs is increased understanding of their benefits and the technology for both vehicles and fueling. That's why we published "Natural Gas Vehicles: The Decision Starts Here."

The NGV industry is now poised for more growth than ever before. Every day more and more fleet managers and businesses are using innovative and reliable NGV products and services to meet their corporate and organizational needs. NGVs deliver mail to our homes and children to our schools. Everyone reaps the rewards from natural gas vehicles—fleet managers have a superior, efficient and cost-effective fuel to use; the industry has more domestic jobs to offer; our children will live in a world with less pollution and smog; and our dependence on foreign oil will lessen. It's everybody's job to help make the world a better place—one step at a time—and NGVs make that job easier.

As Executive Director of Natural Gas Vehicle Institute, I am committed to helping fleet managers and other decision makers evaluate technologies that meet corporate goals, environmental goals, and economic goals. Nearly every day I am asked, "Are natural gas vehicles right for my fleet?" If you are wondering the same thing, I invite you to use "Natural Gas Vehicles: The Decision Starts Here" to begin to make that decision.

Leo Thomason
Executive Director

Table of Contents



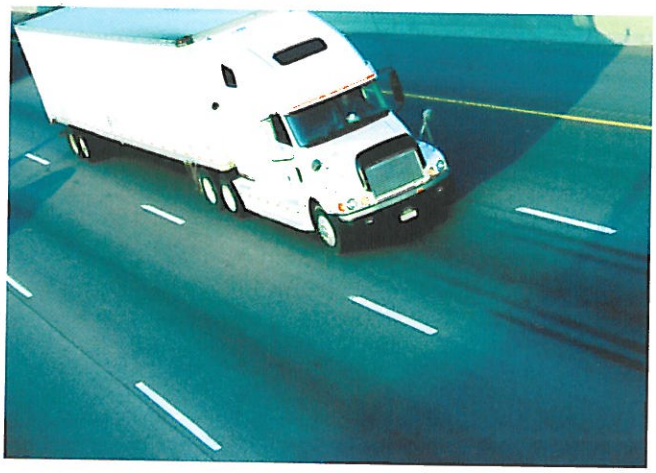
Written, Designed and Published by
Natural Gas Vehicle Institute

Natural Gas Vehicles: The Decision Starts Here, 2010

About NGVi: NGVi is North America's leading provider of training and consulting services on subjects related to natural gas as an alternative vehicle fuel. NGVi's services and programs address the full range of natural gas vehicle and fueling issues.

Chapter 1

Introduction



What Is This Publication All About?

This publication is designed to help fleet managers and others interested in learning more about the use of natural gas as a transportation fuel and natural gas vehicles **(NGVs)**. It provides an overview of natural gas as an energy source and a review of NGVs and fueling technologies. In addition, it will assist those who are considering using natural gas as a transportation fuel in deciding whether natural gas is the right choice. Terms noted in ***bold italics*** are defined in the glossary.

Some of the critical questions answered in this publication include:

- **What Is Natural Gas and How Is It Used?**
- **Why Should You Use Natural Gas as a Transportation Fuel?**
- **How Does Natural Gas Work in Vehicles?**
- **What Types of NGVs Are Available?**
- **How Are NGVs Fueled?**
- **Are NGVs Really Safe?**
- **Are NGVs Right for Me?**

Who Should Use This Publication?

This publication can be used by a wide variety of audiences. Here are a few suggested uses for ***"Natural Gas Vehicles: The Decision Starts Here."***

- Fleet managers and other potential NGV users will discover the publication to be an invaluable tool in helping decide whether natural gas as a transportation fuel is right for them. It will be a resource document that is referred to often.
- Current NGV users will use this publication as a resource for vehicle availability, fueling analysis and other decision making needs.
- Legislators and their staffs will use the publication to better understand NGV technology and the current availability of vehicles and fueling infrastructure.
- Regulatory agencies, such as state environmental protection agencies and local air quality districts, will find the publication helpful in determining how natural gas as a transportation fuel can reduce air pollution and improve air quality.
- Schools, colleges and universities can use the publication as an educational tool or resource.

The Kenworth T800 LNG. Photo courtesy of Kenworth Truck Company

Natural Gas Is the Transportation Fuel for Today...and the Future

With growing concern in the United States for improving air quality, reducing the use of foreign oil and decreasing fleet operating costs, alternative transportation fuels have received increased interest in recent times. Because of its cost advantages, emissions benefits and ample domestic supplies, natural gas is emerging as a prime alternative fuel for our country. Here are a few other reasons why natural gas is the transportation fuel for today and the future.

1. **Natural gas as a transportation fuel has economic advantages over other fuels.**

Although the price varies throughout the country, the national average retail price of natural gas for transportation is significantly lower than that of gasoline, diesel and other alternative fuels. This means that using natural gas as a transportation fuel can save you money while helping to improve air quality.

2. **Using natural gas as a transportation fuel promotes energy security.**

Because natural gas is a domestic fuel produced right here in the United States, it is not subject to supply interruptions or price hikes due to foreign intervention. In addition, using natural gas as a transportation fuel will help reduce a portion of the federal trade deficit attributable to imported oil, which is currently more than 58 percent.

3. **NGVs provide significant environmental advantages compared to other fuels.**

Because natural gas is an inherently clean fuel, it burns cleanly when it is used to fuel vehicles. Natural gas used as a transportation fuel reduces harmful carbon monoxide, hydrocarbon, air toxins and nitrogen oxide emissions that contribute to poor air quality in many areas of the country. Additionally, NGVs emit up to 40% less greenhouse gases.

4. **Natural gas as a transportation fuel provides safety advantages.**

Because natural gas is lighter than air, it dissipates into the air when leaked instead of pooling on the ground like gasoline, diesel and other liquid fuels. Natural gas is non-toxic and cannot be accidentally ingested. NGVs have built-in safety features, including onboard fuel storage cylinders manufactured to strict industry standards of sturdy materials such as steel, aluminum and high density polyethylene as opposed to the sheet metal used for fuel tanks in gasoline vehicles.

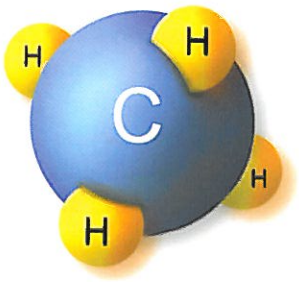
5. **The use of natural gas as a transportation fuel complies with all federal and local laws and regulations requiring the use of alternative fuels.**

Natural gas qualifies as a viable option in every instance in cities, counties or states that have adopted alternative fuel policies or are regulated by federal requirements. This means that if you are affected by regulatory requirements to operate vehicles on an alternative fuel-whether prescribed by federal, state or local law-you can choose natural gas with confidence. Natural gas is recognized by the ***U.S. Environmental Protection Agency (EPA)***, state environmental protection agencies and local regulatory authorities as a clean, domestically-produced alternative fuel.

CNG dispenser. Photo courtesy of ANGI Energy Systems

Chapter 2

What Is Natural Gas and How Is It Used?



What Is Natural Gas?

Natural gas is a gas like oxygen and is found underground where it was formed millions of years ago as organic matter. Tremendous pressure from the overlying rock, combined with the earth's heat, converted the matter into fossil fuels, including coal, oil and natural gas. Coal is solid, oil is liquid and natural gas is a vapor, like air.

Natural gas collects in tiny holes in underground rock and is trapped under layers of solid rock. Natural gas is an organic compound made up of ***hydrogen*** and ***carbon*** and usually is referred to as a "hydrocarbon." ***Methane*** is the main component of natural gas, and makes up over 90 percent of ***"pipeline quality"*** natural gas. Other hydrocarbons that may be found in small amounts in natural gas include ***ethane, propane*** and ***butane***.

What Is Natural Gas Used For?

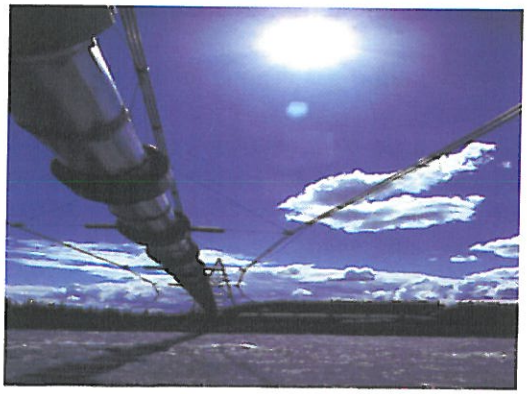
The most familiar uses of natural gas are probably in your home-heating, water heating, cooking, clothes drying and outdoor grilling. Natural gas is also used in commercial businesses and industrial applications. In restaurants, for instance, natural gas is the fuel of choice for cooking, water heating and heating. Natural gas has numerous industrial uses, ranging from electric power generation to heat treating of metals to glass manufacturing. And now, natural gas is receiving great interest as a transportation fuel.

How Is Natural Gas Produced, Transported and Distributed?

Natural gas is "produced" by drilling wells to extract it from underground formations. Since natural gas formations are under tremendous pressure, pumping is not required to extract it. Once natural gas exits the well, it is transported through a system of underground pipelines by "pipeline companies," sometimes referred to as "transmission companies." In the United States, the natural gas industry has constructed more than one million miles of pipeline to transport natural gas to ***local distribution companies,*** like your local gas utility company.

Because natural gas pipelines are located underground, the transmission and distribution systems remain protected from damage. Inclement weather conditions, such as ice storms, do not affect the systems. Pipelines are constructed and tested to operate at high pressures, and ***compressor*** stations are constructed every 50 to 100 miles along the pipeline. According to statistics from the United States Department of Transportation (DOT), the natural gas transmission and distribution system is the safest way to transport energy in the United States.

Pipeline companies transport natural gas from producers' wells to local distribution companies. Once natural gas reaches the distribution pipeline system, the fuel is distributed to utility customers through a similar underground pipeline system.



What Is the Supply Outlook for Natural Gas?

There is no way of knowing exactly how much natural gas is buried in the earth. Geologists and scientists make estimates based on their knowledge of the geological formations that contain this fossil fuel. Some scientists contend that the amount of natural gas which has not yet been discovered may be 10 times more than what has already been found.

In the United States, 35 states have natural gas deposits, with additional gas reserves located offshore in federal waters, particularly in the Gulf of Mexico. There are around 450,000 producing gas wells in the U.S. The states producing the most natural gas include Texas, New Mexico, Oklahoma, Colorado, Alabama, Kentucky, Arkansas, Louisiana, New York, Pennsylvania, Indiana, Michigan, Ohio, Kansas, Virginia, West Virginia, Montana, Utah and Wyoming. There are also large deposits of natural gas in Mexico and Canada.

The American Gas Association (AGA) predicts that in 2030, as much as 83 percent of our country's natural gas demand at current consumption rates will still be met by sources within the continental United States. In addition, Canadian sources of gas, which represent a secure, reliable supply, will provide most of the balance of U.S. gas demand.

How Is Natural Gas Measured?

Natural gas is generally measured by volume, stated in cubic feet. A cubic foot of natural gas is the amount of gas required to fill the volume of one cubic foot under stated conditions of temperature and pressure. For quantifying larger amounts of natural gas, a "therm" is used to indicate 100 cubic feet and ***"mcf"*** is used to indicate 1,000 cubic feet.

Although the energy content in natural gas varies in different locations throughout the country, one average cubic foot of natural gas contains approximately 1,000 ***Bristish Thermal Units (BTUs)*** of heat energy. A BTU is the amount of heat energy required to raise one pound of water one degree Fahrenheit at its point of maximum density. **Table 1** shows the amount of heat energy released in varying quantities of natural gas.

TABLE 1

Heat Energy Per Unit of Measure for Natural Gas

Unit of Measure	Approximate Heat Energy
1 Cubic foot	1,000 BTUs
100 Cubic feet (1 therm)	100,000 BTUs
1,000 Cubic feet (1 mcf)	1,000,000 BTUs

How Does the Heat Energy of Natural Gas Compare to that of Gasoline?

Just as the BTU content of natural gas varies throughout the United States, so does the BTU content of gasoline. As a general rule, there are approximately 125,000 BTUs of heat energy in one average gallon of gasoline. Therefore, it takes about 125 cubic feet or 1.25 therms of natural gas (at 1,000 BTUs per cubic foot) to equal the energy content in one gallon of gasoline (at 125,000 BTUs).

How Is Natural Gas for Vehicles Sold ?

At its 85th National Conference in 2000, the National Conference on Weights and Measures (NCWM) adopted ***gasoline gallon equivalent (GGE)*** as the unit of measure for the sale of ***compressed natural gas*** (CNG). Since natural gas is a gas like oxygen, a mass flow meter is used to measure the mass weight of natural gas being dispensed into an on-board vehicle fuel storage system. The NCWM also adopted 5.660 pounds of natural gas as equal to a GGE.

If you have questions about how compressed natural gas is measured and sold in your area, please contact your local compressed natural gas fuel retailer.

Chapter 3

Why Should I Use Natural Gas as a Transportation Fuel?

Background

Traditional transportation fuels such as gasoline and diesel have been used in the United States for decades. However, skyrocketing prices and growing severity in air pollution problems in many cities, combined with the need to reduce America's dependence on imported oil, are causing us to re-evaluate our current choices of transportation fuels.

What if there was a transportation fuel that was economical, burned cleaner than gasoline and was produced right here in the United States? Sound like a pipe dream? It's not - the transportation fuel described here is natural gas.

1. Natural Gas as a Transportation Fuel Has Economic Advantages

Natural gas is an economical fuel that has been used to heat homes, cook food, heat water and fuel industrial processes for decades. The use of natural gas as a transportation fuel is no exception to that economic rule. Just as the price for gasoline and diesel vary in different parts of the country, so does the price of natural gas as a vehicle fuel. Still, the national average retail cost of natural gas for vehicles, including the cost of compression and appropriate taxes, ranged in 2008 from about $0.84 to $3.19 per equivalent gallon of gasoline. This makes natural gas as a transportation fuel very economic at the pump.

In addition, because natural gas is an inherently clean fuel, it reduces engine wear. Therefore, depending upon usage, using natural gas to power vehicles can significantly extend engine life and decrease engine maintenance.

2. Natural Gas Is a Domestic Fuel

Perhaps one of the most compelling advantages for natural gas as a transportation fuel is that it is produced right here in the U.S. The United States Department of Energy reports 2009 oil consumption in the United States as 18.7 million barrels per day. Currently, around 82 percent of this oil comes from imports, and that percentage is projected to rise as domestic production continues to decline.

3. Natural Gas as a Transportation Fuel Can Improve Our Environment

In the United States, 125 million Americans breathe polluted air that threatens their health. According to the United States Environmental Protection Agency, up to 50 percent of our nation's air pollution is created by exhaust emissions from cars, trucks, buses and other vehicles. While there has been substantial improvement in the environmental performance of new vehicles, the number of vehicle miles traveled in the last 20 years has nearly doubled. This increase in vehicle miles traveled, combined with the high projected cost of additional improvements in environmental performance of new vehicles, makes the use of alternative fuels like natural gas a highly attractive option for further reductions like air pollution.

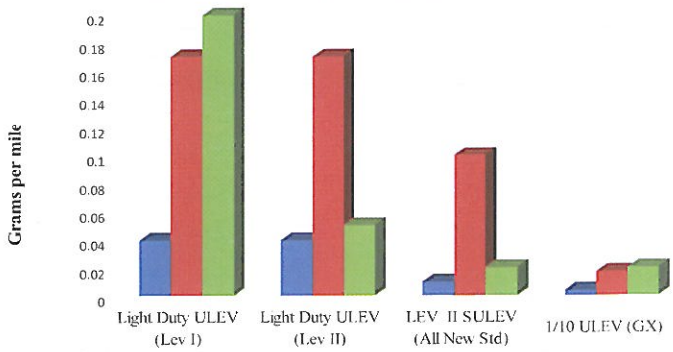
Perhaps the most serious air pollutant, ozone, is created when hydrocarbons emitted from vehicles (and other sources) are combined with nitrogen oxide (also emitted from vehicles and other sources) and sunlight. There are currently 57 metropolitan areas in the country which are in extreme, severe or serious ozone nonattainment with national ambient air quality standards established by the EPA. In addition, carbon monoxide is another pollutant prevalent in many metropolitan areas of the United States. Vehicle exhaust emissions contribute greatly to the unhealthful levels of carbon monoxide.

Natural gas vehicles demonstrate significantly reduced levels of carbon monoxide, hydrocarbon and nitrogen oxide compared to gasoline and therefore can be a strong force in improving air quality in the nation. Why do NGVs operate so cleanly? Primarily because the fuel itself, natural gas, is an inherently clean fuel.

Natural gas is generally composed of at least 90 percent methane and may contain other hydrocarbons in small amounts including ethane, propane and butane. Because methane is a relatively pure component, the emissions of hydrocarbons, carbon monoxide and in some cases nitrogen oxides can be significantly less from an NGV than from a gasoline vehicle. **Table 2** denotes actual emissions results from tests conducted on a 2008 model-year vehicle.

TABLE 2 **Emission Test Results (g/mile)**

The 2008 Honda Civic GX operating on natural gas beats even the toughest emission standards



	Light Duty ULEV (Lev I)	Light Duty ULEV (Lev II)	LEV II SULEV (All New Std)	1/10 ULEV (GX)
NMOG	0.04	0.04	0.01	0.004
CO(x.1)	0.17	0.17	0.1	0.017
NOX	0.2	0.05	0.02	0.02

4. Natural Gas as a Transportation Fuel Meets Federal Legislative Goals

The Energy Policy Act of 1992

The ***Energy Policy Act of 1992 (EPAct)*** was designed to establish a firm energy policy for the United States and to reduce America's dependence on foreign oil. A significant portion of EPAct 1992 deals with alternative transportation fuels, requiring their use in certain fleets located in metropolitan areas with a 1980 population of 250,000 or more.

Under EPAct, alternative fuels are defined as: "natural gas, methanol, ethanol, propane, hydrogen, coal-derived liquids, biological materials, electricity or any other fuel that the Secretary of Energy finds to be substantially not petroleum which would yield substantial environmental benefits." (Traditional liquid fuels, including reformulated gasoline and diesel, are not considered alternative fuels under EPAct.) The purchase of NGVs by any fleet operator falling under the requirements of EPAct will fully satisfy the requirements of this law.

In 2006, the minimum alternative fuel vehicle purchase requirement for federal and state government fleet operators established by EPAct 1992 reached its maximum level of 75 percent for new light-duty vehicles.

A list of metropolitan areas affected by EPAct is shown in **Appendix A.**

The Energy Policy Act of 2005

The Energy Policy Act of 2005 offers consumers and businesses federal tax credits when they purchase fuel-efficient vehicles and energy-efficient appliances and products. EPAct 2005 authorized $3.5 million each year from 2006 to 2010. The tax credit equals 50% of the incremental cost of the vehicle, plus an additional 30% of the incremental cost for vehicles with near-zero emissions (SULEV or Bin 2 for vehicles <14,001 lb GVWR).

The credit is available for the purchase of light-, medium-, and heavy-duty vehicles and fuel-cell, hybrid, and dedicated natural gas, propane, and hydrogen vehicles. For non-tax paying entities, the credit can be passed back to the vehicle seller. The tax credit can be applied to vehicle purchases made after December 31, 2005. It currently expires December 31, 2010, although efforts are underway to extend the deadline. The guidelines are available on the IRS website.

The law also provides for federal tax credits for those who purchase alternative-fueled vehicles or who build alternative fueling stations. Vehicle credits apply to the incremental cost of an alternative-fueled vehicle compared to its gasoline counterpart, and include either OEM or converted vehicles. The fueling facility credit applies to each fueling station installed by a taxpayer at a single location. **Table 3** denotes the maximum tax credits allowed in EPAct 2005. Natural gas vehicles and/or fueling stations fully qualify for these tax credits.

The following are incremental cost limits for dedicated AFVs:

TABLE 3

AFV Maximum Tax Credits

8,500 GVW or lighter	$ 5,000
8,501 - 14,000 GVW	$10,000
14,001 - 26,000 GVW	$25,000
26,001 GVW and heavier	$40,000
Note: GVW = Gross Vehicle Weight	

A companion federal bill titled SAFETEALU 2005 created an excise tax credit of $0.50 per gallon or gallon equivalent for compressed natural gas, liquefied natural gas, liquid petroleum gas, hydrogen and other alternative fuels eligible when used in on-road vehicles. SAFETEALU 2005 Fuel Tax Incentives (VEETC) also allows for non-tax paying entities (municipalities, counties, transit agencies, etc.) to receive a $0.50 per gallon equivalent rebate as opposed to a tax credit. If there is no "seller," the credit goes to the user.

The tax credit is paid to eligible recipients on a regular basis without regard to the amount of excise tax paid and this credit currently expired December 31, 2009, but efforts are underway to extend the deadline.

Common EPACT 2005 Tax Incentive Questions:

1. Who gets the credit for alternative fuels?
   The seller of the fuel takes the fuel tax credit from VEETC, or the end-user of the fuel if the fueling station belongs to that entity and the entity is the only user receiving fuel from that station.

2. Do tax exempt entities really qualify for credit?
   Yes. Tax exempt entities receive a cash rebate for fuel that they dispense to themselves or sell to other entities.

3. How does an organization register?
   You must register with the Internal Revenue Service in advance using Form 637.

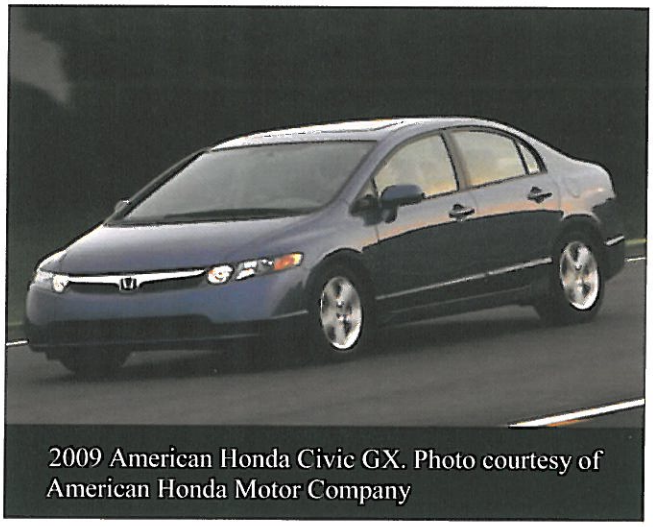
4. What forms are used to claim the credits?
   Tax paying entities use Form 4136; non-tax paying entities use Form 8849.

5. Is the seller required to pass credit to the customer?
   No, the seller is not required to pass any credits on to the end users.

IRS Forms & Instructions

There are a number of Internal Revenue Service (IRS) forms and documents that must be utilized when claiming tax credits resulting from EPAct 2005. They are available from the IRS website at http://www.irs.gov/formspubs/lists/0,,id=97817,00.html and include the following.

- Form 8910 AFV Credit to claim alternative fuel vehicle credit
- Form 8911 Fueling Station Credit to claim the infrastructure tax credit
- Form 637 "Application for Registration" to register to qualify for fuel credit
- Form 8849 (schedule 6) to claim fuel credit, if tax exempt
- Form 720 to pay the excise tax owed on natural gas, if taxable fuel is being sold/used; can use portion of credit to offset taxes owed here



2009 American Honda Civic GX. Photo courtesy of American Honda Motor Company

Chapter 4

How Does Natural Gas Work in Vehicles?

The History of Natural Gas Vehicles

Natural gas has been used as a transportation fuel in several countries since the 1930s. Today, there are over 6 million NGVs operating worldwide and the number is predicted to grow to 50 million by 2020. The top five countries operating NGVs are Pakistan with 2,400,000, Argentina with 1,807,000, Iran with 1,666,000, Brazil with 1,632,000, and India with 725,000. Although the use of natural gas in vehicles is not new, recent advances in NGV technology allow users to operate vehicles on natural gas with no noticeable difference in performance compared to traditional fuels.

Natural Gas Vehicle Options

Fleet managers and others interested in natural gas vehicles have two basic options:

- purchase NGVs directly from vehicle manufacturers offering natural gas vehicles
- purchase vehicles that have been legally modified to operate on natural gas using a U.S. Environmental Protection Agency or California Air Resources Board certified conversion system

These options provide flexibility and allow fleet managers to choose vehicles that best meet the needs of their fleet.

How Vehicles Operate on Natural Gas

Natural gas vehicles are either ***bi-fuel*** or ***dedicated.*** Bi-fuel NGVs operate on either natural gas or gasoline. Fuel selection is made by an automated fuel selection system.

Dedicated NGVs operate only on natural gas, and there is no gasoline fuel system present. Generally, dedicated NGVs demonstrate better vehicle performance and emissions than bi-fuel NGVs because their engines can take advantage of the fuel characteristics of only one fuel - natural gas - instead of having to accommodate two fuels.

How a Bi-Fuel NGV Operates

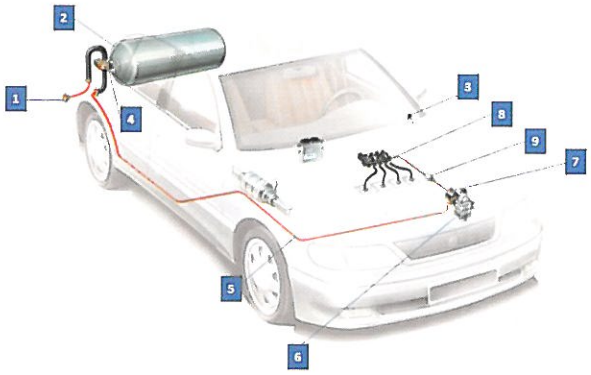
Figure 1 illustrates how a bi-fuel natural gas vehicle operates and denotes the major components of an NGV fuel system. **Figure 2** illustrates how a dedicated NGV operates.

Compressed Natural Gas Fuel Storage Cylinders

All NGVs require special ***onboard fuel storage cylinders*** available in a variety of sizes to meet practically every fuel storage need. There are four types of onboard natural gas fuel storage containers: ***Type 1 – all metal, Type 2 – metal lined with hoop-wrapped composite overwrap, Type 3 – metal lined with fully-wrapped composite overwrap*** and ***Type 4 – all composite***. Type 2 and 3 fuel storage containers are made of steel or aluminum covered with a strong composite material made of carbon and glass fibers combined with epoxy resin. All-composite containers are made with a high density polyethylene (plastic) liner covered with carbon and glass fibers mixed with epoxy resin.

CNG fuel storage cylinders produced on or after March 27, 1995 must be manufactured, tested and certified in accordance with ***National Highway Traffic Safety Administration (NHTSA)*** cylinder safety standards. All cylinders manufactured to NHTSA specifications must receive a detailed external visual inspection by a qualified trained person every three years or 36,000 miles, whichever comes first, and after any vehicle fire or accident.

FIGURE 1

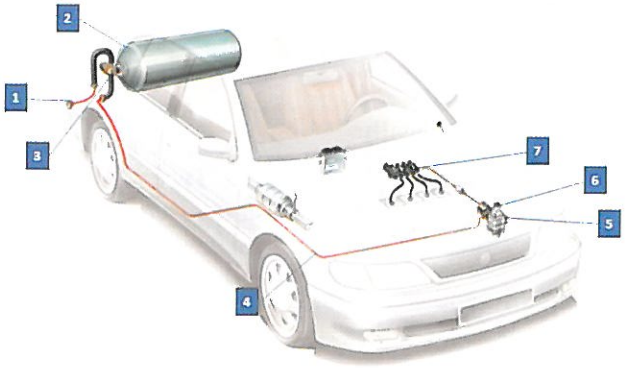


HOW A BI-FUEL NGV WORKS

The above diagram illustrates the operation of a bi-fuel natural gas vehicle

1. Compressed natural gas enters the vehicle through the natural gas fuel receptacle.
2. It flows into high-pressure storage cylinders.
3. An automatic fuel selection device selects natural gas or gasoline.
4. When natural gas is selected and is needed by the engine, it leaves the cylinders and passes through the cylinder valve.
5. The gas goes through the high-pressure fuel line and enters the engine compartment.
6. Gas enters the regulator, which reduces the pressure from up to 3,600 pounds per square inch (psi) to the pressure required to open the fuel injectors.
7. The solenoid valve allows natural gas to pass from the regulator into the fuel injectors. (Or, the solenoid valve will shut off the natural gas when the engine is not running or when gasoline is selected.)
8. Natural gas mixed with air flows down through the fuel-injection system and enters the engine's combustion chambers.
9. When gasoline is selected, the vehicle's conventional gasoline system is activated and the natural gas system is shut off.

FIGURE 2



HOW A DEDICATED NGV WORKS

The above diagram illustrates the operation of a dedicated natural gas vehicle

1. Compressed natural gas enters the vehicle through the natural gas fuel receptacle.
2. It flows into high-pressure storage cylinders.
3. When natural gas is required by the engine, it leaves the cylinders and passes through the cylinder valve.
4. The gas goes through the high-pressure fuel line and enters the engine compartment.
5. Gas enters the regulator, which reduces pressure from up to 3,600 psi to the pressure required to open the fuel injectors.
6. The solenoid valve allows natural gas to pass from the regulator into the fuel injectors. (Or, the solenoid valve shuts off the natural gas when the engine is not running.)
7. Natural gas mixed with air flows down through the fuel-injection system and enters the engine's combustion chambers.

All natural gas fuel storage cylinders will accept pressures ranging from 2,400 psi to 3,600 psi at 70^{O} Fahrenheit (F).

CNG fuel storage cylinders produced prior to March 27, 1995 were manufactured, tested and certified in accordance with U.S. Department of Transportation (DOT) or Transport Canada (TC) regulations or ANSI/NGV2 standards. All cylinder manufactured to the ANSI/NGV2 standard have a 10- to 25-year useful life with no provision for useful life extension.

Table 4 depicts the average size, capacity and weight of similarly-sized CNG fuel storage containers made of varying materials.

CNG fuel storage cylinders are manufactured to strict industrial standards with sturdy materials such as steel, aluminum and high density polyethylene. These fuel storage containers are considered much safer than those used for conventional liquid fuels, which are made of thin sheet metal and in some cases plastic. CNG fuel storage cylinders have a very high safety factor, are tested to a nominal 3,600 psi pressure at 70^{O}F and are designed for a minimum burst pressure of 8,100 psi. Fuel storage containers are subject to a cyclic pressure test. This test includes cycling (filling and discharging the container) at extreme temperatures, ranging from -40^{O} to +180^{O}F.

Cost of Converting Vehicles to Operate on Natural Gas

The costs to convert a gasoline vehicle to operate on natural gas vary, depending on factors such as:

- the type of conversion system selected
- the type of vehicle to be converted and the ease with which the system can be installed
- the quantity of onboard fuel storage desired
- the type of onboard fuel storage cylinders selected
- local labor rates for conversion

Nationally, the average conversion cost of a passenger car ranges from $13,000 to $14,000. Similar costs for a light-duty pickup truck or van ranges from $16,000 to $18,000, depending on the factors cited above. Conversion of a medium-duty gasoline vehicle ranges from $18,000 to $22,000, again depending on the factors cited above.

TABLE 4

A COMPARISON OF ONBOARD STORAGE CYLINDERS

TYPE	SIZE	CAPACITY	WEIGHT
Type 1 ALL-STEEL	10" x 48"	456 SCF*	124 lbs.
Type 2 HOOP-WRAPPED ALUMINIUM COMPOSITE	10" x 48"	400 SCF	70 lbs.
Type 3** FULLY-WRAPPED ALUMINIUM COMPOSITE	10" x 48"	403 SCF	63 lbs.
Type 4 ALL-COMPOSITE	10" x 48"	420 SCF	35 lbs.

* SCF = Standard Cubic Feet (124 SCFs = one gasoline gallon equivalent)

** There is a cylinder manufacturer in Canada that makes a Type 3 cylinder that is the same size and weighs the same as the Type 4.

Chapter 5

What Types of Natural Gas Vehicles Are Available for Purchase Today?

Light-, medium- and heavy-duty vehicle manufacturers are producing NGVs for sale in the United States. In addition, small volume manufacturers (SVMs) produce systems that allow a variety of gasoline engines to operate on natural gas.

The following tables demonstrate most of the original equipment manufacturer (OEM) vehicles, engines and SVM systems available for purchase today.

Original Equipment Manufacturers

Passenger Cars - Light-Duty (<10,000 GVWR)

Manufacturer	Vehicle Make & Model	Class	Category	Fuel/Technology
Honda	Civic GX	Class 1	Light-Duty Sedan	CNG

Trucks - Medium-Duty (10,000 - 33,000 GVWR)

Manufacturer	Vehicle Make & Model	Class	Category	Fuel/Technology
Foton America Bus Co., Inc.	LD1000	Class 3	Medium-Duty Truck	CNG
Foton America Bus Co., Inc.	MD3000	Class 7	Medium-Duty Truck	CNG/LNG
Freightliner	M2-112	Class 7-8	Medium-/Heavy-Duty Truck	CNG/LNG

Truck Chassis - Medium-Duty (10,000 - 33,000 GVWR)

Manufacturer	Vehicle Make & Model	Class	Category	Fuel/Technology
Freightliner Custom Chassis	MB55 Commercial Bus Chassis	Class 6-7	Medium-Duty Chassis	CNG
Freightliner Custom Chassis	MT-45 CNG Chassis	Class 4-5	Medium-Duty Chassis	CNG
Freightliner Custom Chassis	MT-55 CNG Chassis	Class 6-7	Medium-Duty Chassis	CNG

Terminal Tractor - Medium-Duty (10,000 - 33,000 GVWR)

Manufacturer	Vehicle Make & Model	Class	Category	Fuel/Technology
Kalmar Industries	Kalmar Ottawa 4x2-CNG	Class 4	Medium-Duty Tractor	CNG
Kalmar Industries	Kalmar Ottawa 4x2-LNG	Class 4	Medium-Duty Tractor	LNG

Transit Bus/Shuttle - Medium-Duty (10,000 - 33,000 GVWR)

Manufacturer	Vehicle Make & Model	Class	Category	Fuel/Technology
North American Bus Industries, Inc.	LFW	Class 7	Medium-Duty Bus	CNG/LNG
North American Bus Industries, Inc.	Metro 45C	Class 7	Medium-Duty Bus	CNG/LNG
North American Bus Industries, Inc.	Ultra LF	Class 7	Medium-Duty Bus	CNG
ElDorado National	Passport	Class 6	Medium-Duty Bus/Shuttle	CNG
Krystal Koach	Chevrolet KK36	Class 6	Medium-Duty Shuttle/Bus	CNG
Krystal Koach	International KK35 - CNG	Class 7	Medium-Duty Shuttle/Bus	CNG

Specialty Vehicles - Medium-Duty (10,000 - 33,000 GVWR)

Manufacturer	Vehicle Make & Model	Class	Category	Fuel/Technology
North American Bus Industries, Inc.	American Heritage Streetcar	Class 7	Medium-Duty Specialty Vehicle	CNG/LNG
Schwarze	A7000 CNG Street Sweeper	Class 7	Medium-Duty Specialty Vehicle	CNG
TYMCO	Model 600 Street Sweeper	Class 7	Medium-Duty Specialty Vehicle	CNG
Allianz Johnston	CNG 400 Street Sweeper	Class 7	Medium-Duty Specialty Vehicle	CNG
Elgin Sweeper Company	Crosswind & Eagle	Class 7	Medium-Duty Specialty Vehicle	CNG

Transit, Shuttle & School Buses - Heavy-Duty (>33,000 GVWR)

Manufacturer	Vehicle Make & Model	Class	Category	Fuel/Technology
Blue Bird Corp	All American Rear Engine School Bus	Class 8	Heavy-Duty Bus	CNG
Daimler	Orion VII Low Floor - CNG	Class 8	Heavy-Duty Bus	CNG
ElDorado National	Axess 35 & 40	Class 8	Heavy-Duty Bus	CNG/LNG
ElDorado National	E-Z Rider II 30 & 35	Class 8	Medium-Duty Bus	CNG/LNG
ElDorado National	XHF 29 & 33 & 35	Class 8	Heavy-Duty Bus	CNG/LNG

Transit, Shuttle & School Buses - Heavy-Duty (>33,000 GVWR)

Manufacturer	Vehicle Make & Model	Class	Category	Fuel/Technology
Foton America Bus Co., Inc.	L40	Class 8	Heavy-Duty Bus	CNG
New Flyer	C/L30LF	Class 8	Heavy-Duty Bus	CNG/LNG
New Flyer	C/L35LF	Class 8	Heavy-Duty Bus	CNG/LNG
New Flyer	C/L40LF	Class 8	Heavy-Duty Bus	CNG/LNG
North American Bus Industries, Inc.	BRT Brand	Class 8	Heavy-Duty Bus	CNG/LNG
Thomas Built	Saf-T-Liner HDX	Class 8	Heavy-Duty Bus	CNG

Trucks - Heavy-Duty (>33,000 GVWR)

Manufacturer	Vehicle Make & Model	Class	Category	Fuel/Technology
Autocar	Xpeditor	Class 8	Heavy-Duty Truck	CNG
Foton America Bus Co., Inc.	HD5000	Class 8	Heavy-Duty Truck	CNG/LNG
Kenworth	T800 LNG	Class 8	Heavy-Duty Truck	LNG
Mack Trucks, Inc.	TerraPro LE	Class 8	Heavy-Duty Truck	CNG/LNG
Peterbilt	365	Class 8	Heavy-Duty Truck	CNG/LNG
Peterbilt	384	Class 8	Heavy-Duty Truck	CNG/LNG

Refuse, Specialty & Chassis - Heavy-Duty (>33,000 GVWR)

Manufacturer	Vehicle Make & Model	Class	Category	Fuel/Technology
Crane Carrier	CNG Chassis	Class 8	Heavy-Duty Chassis	CNG
Elgin	Broom Bear	Class 8	Heavy-Duty Specialty	CNG
McNeilus	Front-Loaders; Rear-Loaders; Side-Loaders	Class 8	Heavy-Duty Refuse	CNG

Small Volume Manufacturers

SVM systems must comply with United States Environmental Protection Agency, Mobile Source Enforcement Memorandum 1A; *Tampering Enforcement Policy For Alternative Fuel Conversions* dated June 25, 1974 and revised June 16, 1998, and be certified by the EPA and/or the California Air Resources Board (CARB) to be legally installed on an on-road vehicle operating in the United States. Any NGV conversion system installed on a vehicle operating on-road in the United States that is not EPA and/or CARB certified may result in a fine of $10,000 per day, per vehicle.

To obtain EPA and/or CARB certification, a vehicle must be purchased or otherwise acquired by the small volume manufacturer (SVM) seeking certification, have the SVM engine conversion system and associated fuel system components installed on the vehicle and have the vehicle emissions tested using a dynamometer. The dynamometer is used to run the modified vehicle on a computer-simulated, federally-regulated drive cycle to test the vehicle's fuel system and exhaust emissions.

The process of obtaining the vehicle, installing the SVM system and associated fuel system, and having the vehicle emissions tested can be expensive (up to $50,000 just for the emissions test). The results of the emissions test are sent to EPA and/or CARB. One or both of these agencies may issue a certificate of conformity for the vehicle tested. The certification is not for the specific vehicle, but rather the vehicle's engine family or engine test group. The engine family is available on certain models of the OEM whose modified vehicle was emissions tested.

An SVM may have an EPA certification for an engine family that is available on, for example, a 2009 pickup. The engine in the vehicle tested is likely available on about 60% of that model of the 2009 pickups manufactured by the specific OEM. This means that the certification covers about 60% of the specific model of the OEMs pickups available for purchase in 2009. If modifying one or more of these vehicles to operate on natural gas is being considered, it is important to purchase the OEM model that has the engine family installed in the vehicle.

EPA requires that SVM modified vehicles must continue to meet the applicable certification standard when operating on the certification fuels (both gasoline and natural gas) over the life of the vehicle.

Small Volume Manufacturer Products

Manufacturer	Vehicle Make & Model	Class	Category	Fuel/Technology
IMPCO Technologies, Inc.	2009 Chevrolet Impala	Class 1	Light-Duty Sedan	Bi-Fuel: CNG/Gas; Bi-Fuel: CNG/E85
NaturalDrive	2009 Chevrolet Impala	Class 1	Light-Duty Sedan	CNG
Altech Eco	CNG Converted 2008 & 2009 2.0L Ford Focus	Class 1	Light-Duty Sedan	Bi-Fuel: CNG/Gas & CNG
Altech Eco	CNG Converted 2010 2.3L Ford Fusion	Class 1	Light-Duty Sedan	Bi-Fuel: CNG/Gas & CNG
BAF Technologies	Ford Crown Victoria (Lincoln Town Car & Mercury Marquis)	Class 1	Light-Duty Sedan	CNG
IMPCO Technologies, Inc.	2008 & 2009 Chevrolet Silverado	Class 2	Light-Duty Truck	Bi-Fuel: CNG/Gas; Bi-Fuel: CNG/E85
IMPCO Technologies, Inc.	2008 Chevrolet Express & G-Van Cutaway	Class 2	Light-Duty Van/Wagon	Bi-Fuel: CNG/Gas
FuelTek	2008 Ford E-150 Van	Class 2	Light-Duty Van/ Wagon	Bi-Fuel: CNG/Gas
FuelTek	2008 Ford E-250 Van	Class 2	Light-Duty Van/Wagon	Bi-Fuel: CNG/Gas
FuelTek	2008 Ford E-350 Van & Club Wagon	Class 2	Light-Duty Van/Wagon	Bi-Fuel: CNG/Gas
FuelTek	2008 Ford F-250 Pickup	Class 2	Light-Duty Truck	Bi-Fuel: CNG/Gas

Small Volume Manufacturer Products

Manufacturer	Vehicle Make & Model	Class	Category	Fuel/Technology
IMPCO Technologies, Inc.	2008 GMC Savana	Class 2	Light-Duty Van/Wagon	Bi-Fuel: CNG/Gas
Baytech Corporation	Chevrolet Express 2500 & 3500 Cutaway Van	Class 2	Light-Duty Van/Wagon	CNG
Baytech Corporation	Chevrolet Express 2500 & 3500 Passenger & Cargo Van	Class 2	Light-Duty Van/ Wagon	CNG
Baytech Corporation	Chevrolet Silverado 2500HD & 3500HD Pickup	Class 2	Light-Duty Truck	Bi-Fuel: CNG/Gas
BAF Technologies	Ford E-350 Van	Class 2	Light-Duty Van/Wagon	CNG
BAF Technologies	Ford F-150	Class 2	Light-Duty Truck	CNG
Baytech Corporation	GMC Savana 2500 & 3500 Cutaway Van	Class 2	Light-Duty Van/Wagon	CNG
Baytech Corporation	GMC Savana 2500 & 3500 Passenger & Cargo Van	Class 2	Light-Duty Van/Wagon	CNG
Baytech Corporation	GMC Sierra 2500HD & 3500HD Pickup	Class 2	Light-Duty Truck	Bi-Fuel: CNG/Gas & CNG
IMPCO Technologies, Inc.	2008 & 2009 GMC Sierra	Class 2	Light-Duty Truck	Bi-Fuel: CNG/Gas; Bi-Fuel: CNG/E85
NaturalDrive	GMC Yukon	Class 2	Light-Duty SUV	CNG
NaturalDrive	GMC Sierra	Class 2	Light-Duty Truck	CNG
NaturalDrive	GMC Savana	Class 2	Light-Duty Van	CNG
NaturalDrive	Chevrolet Silverado	Class 2	Light-Duty Truck	CNG
NaturalDrive	Chevrolet Tahoe	Class 2	Light-Duty SUV	CNG
NaturalDrive	Chevrolet Suburban	Class 2	Light-Duty SUV	CNG
NaturalDrive	Chevrolet Avalanche	Class 2	Light-Duty Truck	CNG
NaturalDrive	Chevrolet Express	Class 2	Light-Duty Van	CNG
Baytech Corporation	2007 & 2009 Workhorse Custom Chassis W42 Light Duty	Class 2-3	Light-/Medium-Duty Truck	Bi-Fuel: CNG/Gas & CNG
BAF Technologies	Ford F-250 & F-350	Class 2-3	Light-/Medium-Duty Truck	CNG
Baytech Corporation	2007 & 2009 Chevrolet W3500	Class 3	Medium-Duty Truck	Bi-Fuel: CNG/Gas & CNG
Baytech Corporation	2007 & 2009 GMC W3500	Class 3	Medium-Duty Truck	Bi-Fuel: CNG/Gas & CNG

Small Volume Manufacturer Products

Manufacturer	Vehicle Make & Model	Class	Category	Fuel/Technology
Baytech Corporation	2007 & 2009 Isuzu NPR	Class 3	Medium-Duty Truck	Bi-Fuel: CNG/Gas & CNG
FuelTek	2008 Ford F-350 Pickup	Class 3	Medium-Duty Truck	Bi-Fuel: CNG/Gas
Baytech Corporation	Chevrolet Silverado 3500HD Chassis Cab	Class 3	Medium-Duty Truck	Bi-Fuel: CNG/Gas & CNG
Baytech Corporation	GMC Sierra 3500HD Chassis Cab	Class 3	Medium-Duty Truck	Bi-Fuel: CNG/Gas & CNG
Baytech Corporation	2007 & 2009 Chevrolet W4500	Class 4	Medium-Duty Truck	Bi-Fuel: CNG/Gas; CNG
Baytech Corporation	2007 & 2009 GMC W4500	Class 4	Medium-Duty Truck	Bi-Fuel: CNG/Gas; CNG
Baytech Corporation	2007 & 2009 Isuzu NPR HD	Class 4	Medium-Duty Truck	Bi-Fuel: CNG/Gas; CNG
Baytech Corporation	2007 & 2009 Workhorse Custom Chassis W42 Heavy Duty	Class 4	Medium-Duty Truck	Bi-Fuel: CNG/Gas; CNG
Baytech Corporation	Chevrolet Express 4500 Cutaway Van	Class 4	Medium-Duty Van/Wagon	CNG
BAF Technologies	Ford E-450 Cutway & Shuttle	Class 4	Medium-Duty Shuttle/Bus	CNG
Baytech Corporation	GMC Savana 4500 Cutaway Van	Class 4	Medium-Duty Van/Wagon	CNG
Baytech Corporation	2007-2009 Chevrolet C4500 & C5500 Truck & Shuttle Bus Chassis	Class 5-6	Medium-Duty Truck	Bi-Fuel: CNG/Gas; CNG
Baytech Corporation	2007-2009 GMC C4500 & C5500 Truck & Shuttle Bus Chassis	Class 5-6	Medium-Duty Truck	Bi-Fuel: CNG/Gas; CNG
Baytech Corporation	2007-2009 Workhorse Custom Chassis W62	Class 5-6	Medium-Duty Truck	Bi-Fuel: CNG/Gas; CNG
Baytech Corporation	2007-2009 Chevrolet C6500 & C7500 & C8500 Truck Chassis	Class 7	Medium-Duty Truck	Bi-Fuel: CNG/Gas; CNG
Baytech Corporation	2007-2009 GMC C6500 & C7500 & C8500 Truck Chassis	Class 7	Medium-Duty Truck	Bi-Fuel: CNG/Gas; CNG






OEM Contact Information

Manufacturer	Phone	Web Address
Allianz Johnston	800-862-3822	www.allianzsweeper.com
American Honda Motor Co.	800-999-1009	www.automobiles.honda.com/civic-gx-fleet
Autocar	877-973-3486	www.autocartruck.com
Blue Bird Corporation	478-825-2021	www.blue-bird.com
Crane Carrier	918-836-1651	www.cranecarrier.com
Daimler	800-882-8054	www.dcbusna.com
ElDorado National	909-591-9557	www.enconline.com
Elgin	847-741-5370	www.elginsweeper.com
Foton America Bus Co., Inc.	901-347-0412	www.foton-america.com
Freightliner Custom Chassis	800-FTL-HELP	www.freightlinerchassis.com
Kalmar Ottawa 4x2-CNG	609-860-0150	www.kalmarind.com
Kenworth	425-828-5000	www.kenworth.com
Mack Trucks, Inc.	800-866-1177	www.macktrucks.com
McNeilus	507-374-6321	www.mcneilusrefuse.com
New Flyer	204-224-1251	www.newflyer.com
North American Bus Industries, Inc.	256-831-4296	www.nabiusa.com
Peterbilt	940-591-4000	www.peterbilt.com
Schwarze	800-879-7933	www.schwarze.com
Thomas Built	336-889-4871	www.thomasbus.com
TYMCO	254-799-5546	www.tymco.com

Small Volume Manufacturers Contact Information

Manufacturer	Phone	Web Address
Altech Eco	828-654-8300	www.transecoengergy.com
BAF Technologies	214-231-1450	www.baftechnologies.com
Baytech Corporation	650-949-1976	www.baytechcorp.com
FuelTek	720-941-2791	www.fueltek.biz
IMPCO Technologies, Inc.	714-656-1200	www.impco.ws
NaturalDrive Partners, LLC	801-768-2986	www.naturaldrive.com

Chapter 6

How Are Natural Gas Vehicles Fueled?

How Natural Gas Fueling Works

To allow adequate quantities of fuel to be stored onboard vehicles, natural gas must be either compressed or liquefied. Liquefied natural gas (LNG) is used primarily in certain heavy-duty vehicles like transit buses and over-the-road trucks. This discussion will focus on using compressed natural gas for light, medium and other heavy-duty vehicle applications.

Natural gas for transportation is compressed and stored at fueling stations at pressures ranging from 4,000 pounds per square inch (psi) to 5,000 psi. Onboard vehicles, natural gas is stored at pressures ranging from 3,000 psi to 3,600 psi. As a vehicle utilizes fuel, the pressure in its onboard fuel storage cylinders decreases, and refueling eventually becomes necessary. Natural gas fueling operates on the principle of transferring the stored pressurized natural gas of the fueling station's storage tanks to the vehicle's onboard fuel storage cylinders.

Natural Gas Fueling Options

Natural gas fueling is available in a variety of options:

- At ***public*** retail stations
- At ***private onsite stations*** owned and operated by fleet operators;
- At ***"cardlock" stations*** operated by specialized retailers that require a credit card to access the dispensers
- In small, ***vehicle refueling appliance*** units installed at homes and businesses
- In ***portable fueling systems*** utilizing over-the-road transportation of fuel that can be supplied to an onsite dispenser or directly to vehicles

Configurations of Typical Natural Gas Fueling Stations

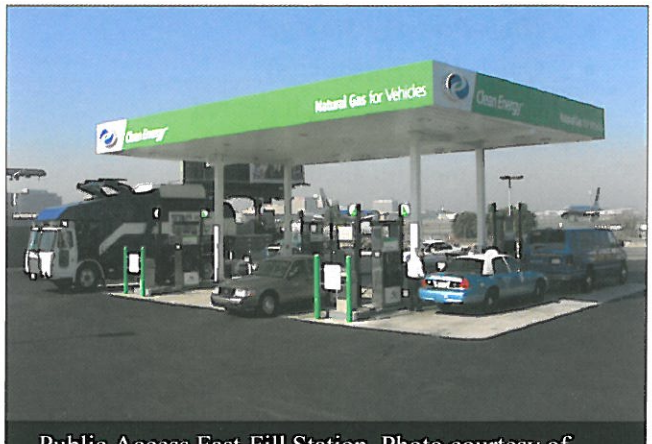
Regardless of the type of natural gas fueling station utilized, there are three basic fueling station configurations:

- **Quick-Fill**
- **Time-Fill**
- **Combination Quick and Time-Fill**

The configuration chosen is determined by the needs of the operator.

Quick-fill is usually used when vehicles must be refueled in a time period similar to that of gasoline or other conventional fuels, say 3 to 7 minutes for automobiles and light-duty trucks. All public natural gas fueling stations are quick-fill.

Time-fill fueling is usually recommended for fleets that utilize onsite fueling with vehicles that return to a central location for a period of 6 to 8 hours, during which they can be refueled. Many fleet operators use time-fill fueling because the fueling station equipment required is often the least expensive.



Public Access Fast-Fill Station. Photo courtesy of Clean Energy

Another natural gas fueling configuration for onsite fleet applications is the ***combination station***, which includes both quick-fill and time-fill capabilities. This type of fueling may be used when some vehicles return to a central location for refueling, usually at night, and when other vehicles need to be refueled in a fairly short period of time and cannot wait for time-fill.

Waste Management Vehicles Fuel at Time-Fill CNG Fueling Station

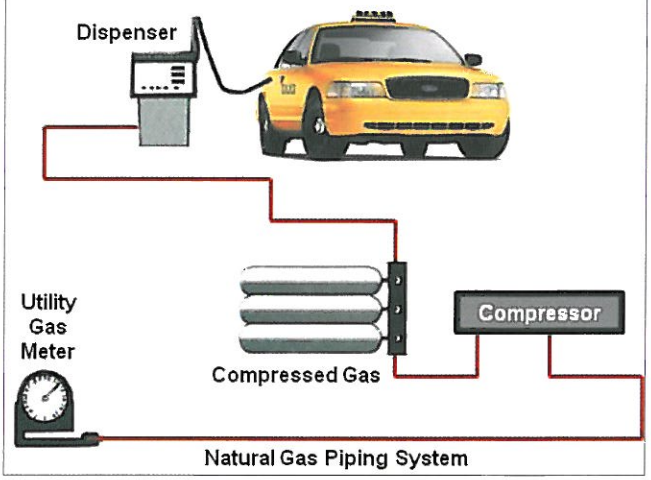
Components: Quick-Fill Station

The major components of a typical quick-fill natural gas fueling station are illustrated in **Figure 3** and include:

- Compressor
- ***High-Pressure Storage***
- Quick-Fill Dispenser(s)
- Credit Card Reader, if desired

At a quick-fill fueling station, natural gas is compressed by the compressor and stored in the high-pressure storage system. When vehicles are being fueled and the pressure of the fuel supply in the storage system begins to drop, the compressor is automatically activated, causing it to replenish the supply of natural gas in the storage system. If desired by the fueling station operator, a credit card allows access to the dispenser, which meters and dispenses natural gas into the fuel storage cylinder(s) onboard the vehicle.

FIGURE 3 QUICK-FILL SYSTEM



Components: Time-Fill Station

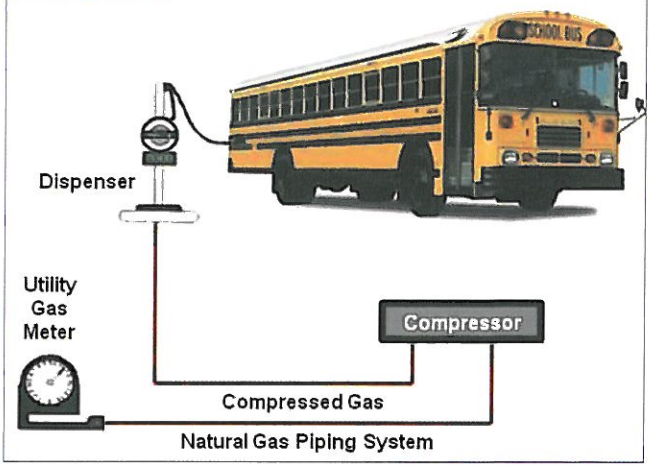
The major components of a typical time-fill natural gas fueling station are illustrated in **Figure 4** and include:

- Compressor
- Time-Fill Dispensers

Using time-fill, vehicles refuel more slowly and therefore receive gas directly from the compressor through special time-fill dispensers. This eliminates the need for a high-pressure storage system. Fueling time is usually 6 to 8 hours.

Time-fill fueling stations are available in a variety of sizes to meet all kinds of customer needs, including the vehicle refueling appliance that can fuel vehicles at home or a business.

FIGURE 4 TIME-FILL SYSTEM



Components: Combination Station

The major components of a typical combination natural gas fueling system are illustrated in **Figure 5** and include:

- Compressor
- High-Pressure Storage
- Quick-Fill Dispenser(s)
- Time-Fill Dispensers
- Credit Card Reader, if desired

When fueling through the quick fill-dispensers, natural gas is provided from the high-pressure storage system to the vehicles' onboard fuel storage cylinders. When fueling through the time-fill dispensers, natural gas is provided to vehicles directly from the compressor. Combination stations are ideal for onsite fueling for fleets that need both quick and time-fill.

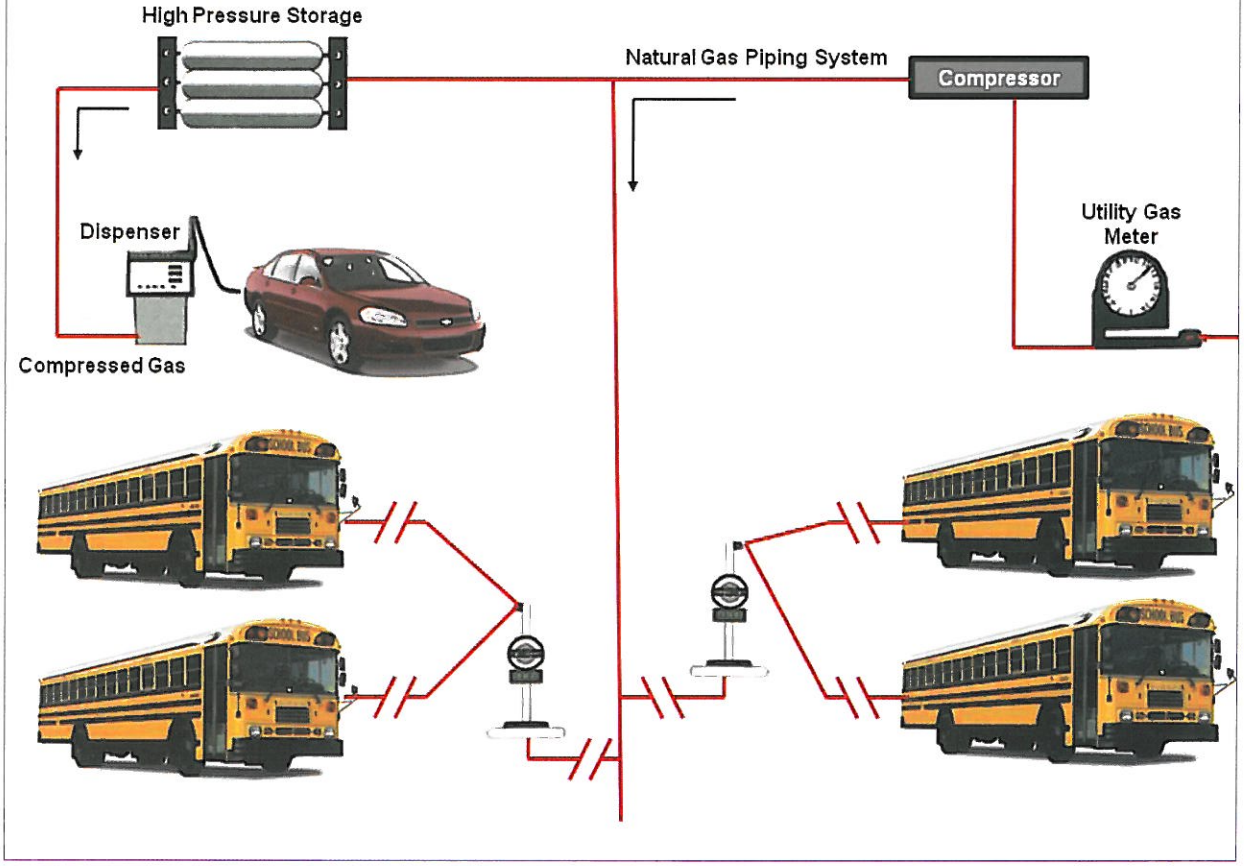
Other Fueling Options

In addition to the three types of stations described, there is a variety of portable fuel delivery systems available utilizing over-the-road transportation of compressed natural gas in tube trailers designed especially for transporting natural gas.

These trailers access natural gas at a distribution point and transport it to a customer's site. When onsite, natural gas can be down-loaded to onsite fuel storage or vehicles can be directly fueled from the system.

FIGURE 5

COMBINATION TIME AND QUICK-FILL FUELING



Codes and Regulations

There are numerous standards, codes and regulations that govern the design and installation of natural gas fueling stations. These standards ensure the safety of construction and operation of natural gas fueling stations. The following is a list of standards or codes which apply to natural gas fueling stations in the United States. Other state or local area building codes also may apply.

ASME
American Society of Mechanical Engineers
www.asme.org
345 E. 47th St.
New York, NY 10017
212-705-7722
Boiler Pressure Vessel (B&PV) Code and Addenda:
Section VIII, Division I- Pressure Vessels
Section V- Nondestructive Examination
Section IX- Welding and Brazing Qualifications
ASME/ANSI B31.3 Chemical Plant and Petroleum Refinery Piping,
American National Standard

ASNT
American Society for Nondestructive Testing
www.asnt.org
P.O. Box 28518
Columbus, OH 43228-0518
614-274-6003
ASNT-TC-1A Recommended Practice

AWS
American Welding Society
www.aws.org
550 LeJeune Road NM
Miami, FL 33135
305-443-9353
D1.1-88 Structural Welding Code- Steel

NEMA
National Electrical Manufacturers Association Standards
www.nema.org
2101 L St. NM
Washington, DC 20037
202-457-8400

NFPA
National Fire Protection Association
www.nfpa.org
11 Tracy Drive
Avon, MA 02269-9101
800-344-3555
NFPA 52 Compressed Natural Gas Vehicular Fuel Systems
NFPA 70 National Electric Code

NEC
National Electric Code
C/O National Fire Protection Association
P.O. Box 9101
Quincy, MA 02269-9101
800-344-3555

DOT
Department of Transportation
www.dot.gov
400 7th St. SW
Washington, DC 20590
202-366-4052
Specification 49 CFR, Sections 172, 178, 393

OSHA
Occupational Safety and Health Act and Title 8, Article 7 of the Administrative Division of Industrial Safety, General Safety Orders
www.osha.gov
C/O Ian Greaves, MD
University of Minnesota School of Public Health
P.O. Box 197
Minneapolis, MN 55455
612-626-9000

UBC
Uniform Building Code, Local Jurisdiction
Published by: International Conference of Building Officials
5360 S. Workman Mill Rd.
Whittier, CA 90601
310-699-0541

UFC
Uniform Fire Code
Published by: International Fire Code Institute
5360 S. Workman Mill Rd.
Whittier, CA 90601
310-699-0124

NIST
National Institute of Standards and Technology Handbook 44
www.nist.gov
Office of Weights and Measures
Building 101-A617
Gaithersburg, MD 20899-0001
301-975-2196

UL
Underwriters Laboratory Approval
www.ul.com
333 Pfingtston Rd.
Northbrook, IL 60062
312-272-8800

Chapter 7

Are Natural Gas Vehicles Really Safe?

Compared to gasoline and diesel vehicles, natural gas vehicles are among the safest vehicles traveling on the roads in the United States today. Why? Because of the unique characteristics of the fuel itself and the rigorous standards to which onboard fuel delivery components and fuel storage cylinders are manufactured.

Natural Gas Is a Safe Transportation Fuel

Because natural gas is a vapor and not a liquid, it has unique characteristics that make it inherently safe. For instance, unlike liquid fuels which pool on the ground when leaked or spilled, natural gas is lighter than air and will dissipate into the atmosphere if leaked. The ignition temperature of natural gas is 1,080 degrees Fahrenheit compared to about 600 degrees Fahrenheit for gasoline, making it more difficult to ignite. Natural gas will burn only when the proper ***air-to-fuel ratio*** exists. Therefore, in concentrations of air below 5 percent or above 15 percent, natural gas will not burn. Natural gas contains only minute amounts of ***toxic substances***, and is neither ***carcinogenic*** nor ***caustic***. In addition, natural gas is non-corrosive and will not contaminate ground water like liquid fuels. All of these characteristics and qualities of natural gas make it safe - perhaps safer than gasoline.

Operating Natural Gas Vehicles Is a Safe Process

One of the main reasons why NGVs have resulted in fewer passenger injuries and deaths is that fires are less likely to occur in crashes involving NGVs than in those involving gasoline-powered vehicles. This is credited to the unique properties of natural gas.

In addition, cylinders used to store natural gas onboard vehicles are manufactured to much more stringent standards and are made from much sturdier materials than those of gasoline vehicles.

Cylinders produced on or after March 27, 1995 must be manufactured in accordance with National Highway Traffic Safety Administration (NHTSA) cylinder safety standards. These cylinders have a 10- to 25-year useful life and have no requirements for re-certification. However, to ensure safety, NHTSA requires that these cylinders must receive a detailed visual inspection for damage or deterioration every 36 months or 36,000 miles, whichever comes first. Cylinders also must be visually inspected after any vehicle fire or accident. Natural gas fuel system inspectors must be trained and can be certified to perform the inspection.

Bus L40 powered by natural gas. Photo courtesy of Foton America

Cylinders produced since March 27, 1995 were manufactured in accordance with U.S. Department of Transportation (DOT) or Transport Canada (TC) regulations or ANSI/AGA NGV2 standards. All cylinders manufactured to these specifications must receive a visual inspection for damage or deterioration every three years. Cylinders manufactured to ANSI/AGA NGV2 specifications also have a 10-25 year useful life.

Fueling Natural Gas Vehicles Is a Safe Process

Natural gas is dispensed into vehicles through sealed systems designed to allow natural gas to flow into the vehicle without any leakage into the environment. Unlike gasoline fuel systems, those of NGVs prevent oxygen from entering the system. This lack of oxygen prevents the fuel from igniting.

In dispensers utilizing ANSI-NGV1 nozzles, unless the nozzle is connected to a receptacle on the vehicle, natural gas will not flow. Therefore, unlike liquid fuels, there is no risk of natural gas flowing out the end of the nozzle into the environment when not connected to the vehicle fuel receptacle or forming a pool on the ground that could be ignited

All natural gas fueling stations built in the United States comply with National Fire Protection Association standards for safety. These standards include stringent construction specifications and comprehensive training requirements for those who fuel NGVs. (For more information on codes and standards, see Chapter 6.)

Driver training is essential to ensure the safe fueling and operation of NGVs. Comprehensive training includes characteristics of the fuel, safe fueling practices, what to do in case of an emergency while fueling the vehicle, how to operate the safety systems at the fueling station and on the vehicle, and what actions to take in case of a vehicle accident.

Sacramento International Airport's Bus fueled at the CNG Fueling Station. Photo courtesy of Sacramento International Airport

Chapter 8

Are Natural Gas Vehicles Right for Me?

If you are a fleet operator or consumer considering NGVs, you probably have several questions like "Are OEM NGVs available in vehicle types that I use?" or "If I choose NGVs, what are my fueling options?" This section of the publication is intended to help you answer some of those questions and to direct you to sources to help you get answers to your specific, local questions.

Can I Buy NGVs Today?

Emphatically, yes! As you saw in Chapter 5, there are a wide variety of natural gas vehicles and engines available for sale today. These vehicles range in size from passenger cars and light-duty trucks to transit buses, and come with full manufacturer warranties. For more detail regarding available NGVs, consult AFVi's "Buyers' Guide," which is a complete directory of all AFVs available for purchase today. The Buyers' Guide is available at www.afvi.org.

If I Choose NGVs, What Are my Fueling Options?

In the United States today, there are over 1,000 natural gas fueling stations. Natural gas as a transportation fuel can be purchased at public retail fueling outlets and fleet user cardlock outlets. It is also available as onsite fueling for fleet operators and individual users.

When deciding which fueling option is best for you, several factors must be considered, such as:

- Do you currently buy fuel from retail outlets or do you have onsite fueling?
- Would it be more economic to buy natural gas from a retail outlet or to install an onsite fueling station?
- Is public fueling available in your area?

Are NGV Economics Favorable?

When evaluating the economics of operating vehicles on natural gas, you will need to consider a number of factors. The following discussion provides some of the issues to consider when deciding whether NGVs are right for you.

What are the total costs to convert existing vehicles to operate on natural gas or what is the incremental cost of OEM NGVs? These costs will be your investment in using natural gas as a vehicle fuel and may be offset by incentives from your local distribution company, state or local government agencies or the federal government

Next, you will want to evaluate the potential savings obtained from operating NGVs. Considered here are issues like fuel cost savings, maintenance cost savings and others. Natural gas usually costs less per equivalent gallon than gasoline or diesel fuel and has maintenance advantages as well. Your local CNG retailer can help you determine your specific savings.

Finally, are there any local operating advantages for NGVs and other alternative-fueled vehicles? These might include priority in queues for taxi or limousine fleets, priority access to congested downtown areas for NGVs, exemption from local transportation control measures (TCMs), and others. The economics of operating NGVs can be very favorable. You will want to take the time to make sure you have accurate information before beginning to evaluate your decision. Calculating simple payback - or life cycle cost analyses - may be advantageous.

Glossary

Air-to-Fuel Ratio: The ratio of air volume to fuel volume. A specified ratio is necessary to achieve a desired character of combustion in a vehicle's engine.

All-Composite Cylinder: A cylinder with a plastic (non-metallic) liner, reinforced with resin impregnated filament winding.

Alternative-Fueled Vehicles (AFVs): Vehicles with engines designed to run on a fuel other than gasoline or diesel.

Alternative Transportation Fuel: Fuels that can be substituted for traditional vehicular fuels like gasoline or diesel.

Aluminum-Composite Cylinder: Any cylinder with an aluminum liner that is reinforced with filament winding.

American National Standards Institute (ANSI): The coordinating organization for the United States' national standards system.

Atmospheric Pressure: The pressure attributable to the weight of the atmosphere (air and water vapor) on the earth's surface. Average atmospheric pressure at sea level (for scientific purposes) is defined as 14.696 pounds per square inch absolute.

Barrel (Oil): A volumetric unit of measurement equivalent to 42 U.S. gallons. This is the unit measurement commonly used to measure oil production and oil reserved within the U.S.

Bi-Fuel Natural Gas Vehicle: A vehicle with an engine capable of running either on natural gas or some other fuel, usually gasoline.

British Thermal Unit (BTU): The quantity of heat necessary to raise the temperature of one pound of water one degree Fahrenheit, from 58.5 to 59.5 degrees Fahrenheit, under standard pressure of 30 inches of mercury at or near its point of maximum density.

Butane (C4H10): A low-boiling paraffin hydrocarbon that results from natural gas production, as well as from a process used in petroleum refining.

Carbon (C): A nonmetallic element found as a constituent of coal, petroleum, asphalt and other organic compounds.

Carbon Monoxide (CO): A colorless, odorless, poisonous, combustible gas formed by incomplete combustion of carbon or reduction of carbon dioxide. CO is a criteria air pollutant that is emitted primarily through tailpipe emissions of a vehicle equipped with a spark-ignited engine.

Carcinogenic: A cancer-causing substance or agent.

Cardlock Station: A fueling station that uses a card similar to a credit card or with a magnetic strip, to access the dispenser and allow fuel to flow into the vehicle's fuel-storage tank(s).

Caustic: A corrosive substance.

Combination Station: A type of natural gas fueling stations that utilizes both timed-fill and quick-fill fueling.

Compressed Natural Gas: Often referred to as CNG, this is natural gas that is highly compressed and stored in high-pressure surface containers. Compressed natural gas is used extensively as a transportation fuel for automobiles, trucks and buses.

Compressor: A mechanical device used to increase the pressure of a gas.

Dedicated Natural Gas Vehicle: A vehicle that operates only on natural gas. Such a vehicle is incapable of running on any other fuel.

Energy Policy Act of 2005 (EPAct 2005): First major energy bill since EPAct 1992.

Environmental Protection Agency (EPA): The United States agency charged with setting policy and guidelines for the protection of national interests in environmental resources.

Ethane (C2H6): A colorless hydrocarbon gas of slight odor having a gross heating value of 1,773 BTUs per cubic foot. It is a normal constituent of natural gas.

Ethanol (C2H4OH): An alcohol fuel made primarily from agricultural products, typically corn.

Fuel-Injection System: A system in a vehicle that allows fuel and air to be mixed in the engine.

Gasoline Gallon Equivalent (GGE): A unit for measuring compressed natural gas sold at public fueling stations, equal in energy value to a gallon of gasoline.

Gross Vehicle Weight (GVW): Maximum weight of a vehicle, including payload.

Heavy-Duty Vehicle: According to the Environmental Protection Agency, a heavy-duty vehicle is any vehicle weighing 8,500 pounds gross vehicle weight (GVW) or more. In California, vehicles weighing more than 14,000 pounds GVW are classified as heavy-duty vehicles.

High-Pressure Storage Tank: A container used to store compressed natural gas at a fueling station.

Hoop-Wrapped Cylinder: A metal-lined cylinder that is reinforced sealed with resin impregnated continuous filament winding.

Hydrogen: A colorless, odorless, inflammable gas which combines chemically with oxygen to form water.

Hydrostatic Testing: A strength test used on cylinders and other equipment. The cylinder is filled with liquid, sealed and subjected to pressure, and monitored. This test is also used to determine whether a container is capable of holding a certain pressure.

Idolene: The fuel used to certify gasoline vehicle emissions.

Lean-Burn Combustion: Engine combustion optimized for a lean fuel-to-air mixture, usually with high turbulence to offset the low flame speed of such mixtures.

Light-Duty Vehicle: According to the Environmental Protection Agency, a light-duty vehicle is any vehicle weighing 8,500 pounds gross vehicle weight (GVW) or less. In California, vehicles weighing less than 6,000 pounds GVW are classified as light-duty vehicles.

Liquefied Natural Gas (LNG): Natural gas that has been liquefied by reducing its temperature to -260 degrees Fahrenheit at atmospheric pressure. In volume at standard conditions, it occupies 1/600 that of natural gas as a vapor.

Liter (L): A metric measurement used to calculate the volume displacement of an engine. One liter is equal to 1,000 cubic centimeters or 61 cubic inches.

Local Distribution Company (LDC): A company that obtains the major portion of its revenue from the operation of a retail natural gas distribution system.

MCF: Term used to define 1,000 cubic feet of natural gas.

Methane (CH4): The first of the paraffin series of hydrocarbons, and the chief constituent of natural gas. Pure methane has a heating value of 1,012 BTUs per cubic foot.

Methanol (CH2OH): An alcohol fuel usually made from natural gas or coal.

National Ambient Air Quality Standards (NAAQS): Legal limits specifying the maximum level and time of exposure that can occur in the outside air for a given air pollutant that is protective of human health and public welfare. NAAQS are standards that must be met in accordance with EPA requirements.

National Highway Traffic Safety Administration (NHTSA): Federal government agency department responsible for national traffic safety.

Natural Gas Distribution System: This term generally applies to mains, services and equipment that carry or control the supply of natural gas from the point of local supply, up to and including the sales meter.

NGV1: An NGV industry standard that pertains to natural gas fueling nozzle and receptacle certification.

NGV2: An NGV industry standard that pertains to onboard fuel-storage cylinder certification.

NGV3: An NGV industry standard that pertains to conversion systems.

NGV4: An NGV industry standard for natural gas fueling stations.

Nitrogen Oxide (NOx): A general term pertaining to compounds of nitrogen oxide (NO), nitrogen dioxide (NO_2) and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes and are major contributors to smog formation and acid deposition. NO_2 is a criteria air pollutant, and may result in numerous adverse health effects.

Non-Methane Organic Gas (NMOG): Non-methane hydrocarbons, plus other organic species such as aldehydes and alcohols, which are not measured as hydrocarbons in current test procedures.

Non-Road Vehicle (off-road vehicle): A vehicle that does not travel streets, roads or highways. Such vehicles include construction vehicles, locomotives, forklifts, golf-carts, etc.

Nozzle: The device on a natural gas fueling dispenser that connects to a receptacle onboard the vehicles and allows fuel to flow into the onboard fuel-storage cylinders.

Onboard Fuel-Storage Cylinder: Cylinders used for storing compressed natural gas on vehicles.

Onsite Fuel-Storage: Cylinders or other vessels used to store compressed natural gas at fueling station sites.

Original Equipment Manufacturer (OEM): The original manufacturer of a vehicle or engine.

Ozone (O3): An odorous, pale blue, reactive toxic chemical gas consisting of three oxygen atoms. Ozone is a product of the photochemical process involving the sun's energy. Ozone exists in the upper atmosphere ozone layer, as well as at the earth's surface. Ozone at the earth's surface causes numerous adverse health effects and is a criteria air pollutant. It is a major component of smog.

Pipeline Quality Gas: A term used to designate the typical chemical composition of natural gas delivered through pipelines.

Portable Fueling System: A system designed to deliver natural gas to fueling stations. Such systems are usually configured as tube trailers, and mobile fuel delivery usually occurs via over-the-road vehicles.

Pounds Per Square Inch (psi): An expression of pressure used to determine gas volume.

Private Fleet: A fleet of vehicles owned by a non-government entity.

Private Onsite Fueling: A fueling station that is built to serve a single fleet of vehicles.

Propane (C3H8): A gas whose molecules are composed of three carbon and eight hydrocarbon atoms. Propane is present in most natural gas in the U.S. and is the first product refined from crude petroleum.

Public Fueling Station: Refers to a fueling station that is accessible to the general public.

Quick-Fill: Refers to the process of fueling a vehicle with natural gas in approximately the same time it would take to fuel the same vehicle with liquid fuels such as gasoline or diesel.

Receptacle: The device onboard an NGV that allows natural gas to flow into the onboard fuel-storage cylinders.

Reformulated Gasoline: Gasoline that has been chemically reformulated to reduce or eliminate one or more toxic substances as specified by the U.S. Environmental Protection Agency.

Regulator: The component in a conversion system that reduces the pressure of the fuel.

Shut-Off Valve: A valve that is usually located between the onboard fuel-storage cylinders and the regulator. This valve usually has a manual shut-off feature.

Small Volume Manufacturer: An individual or company that manufactures or installs a fuel conversion system for a vehicle or engine allowing the vehicle or engine to operate on a fuel other than the fuel which the vehicle or engine was originally certified to use.

Solenoid Valve: A valve that controls the flow of natural gas in a natural gas vehicle.

Steel-Composite Cylinder: Any steel-lined cylinder with filament winding which is usually hoop-wrapped.

Tailpipe Emissions: Emissions resulting from engine operation that exit through a vehicle's tailpipe system.

Thousand Cubic Feet (MCF): The quantity of natural gas occupying a volume of 1,000 cubic feet at a temperature of 60 degrees F, and at a pressure of 14-73/100 pounds per square inch absolute.

Time-Fill: A method of fueling a vehicle with natural gas over an extended period of time, usually six to eight hours.

Toxic Substance: A generic term referring to a harmful substance or group of substances. Typically, these substances are especially harmful to health, such as those considered under the Environmental Protection Agency's hazardous substance program. Technically, any compound that has the potential to produce adverse health effects is considered a toxic substance.

Transport Canada (TC): A Canadian regulatory agency that certifies onboard fuel-storage cylinders for use on vehicles operating in Canada.

Vehicle Conversion: Retrofitting a vehicle engine to run on natural gas.

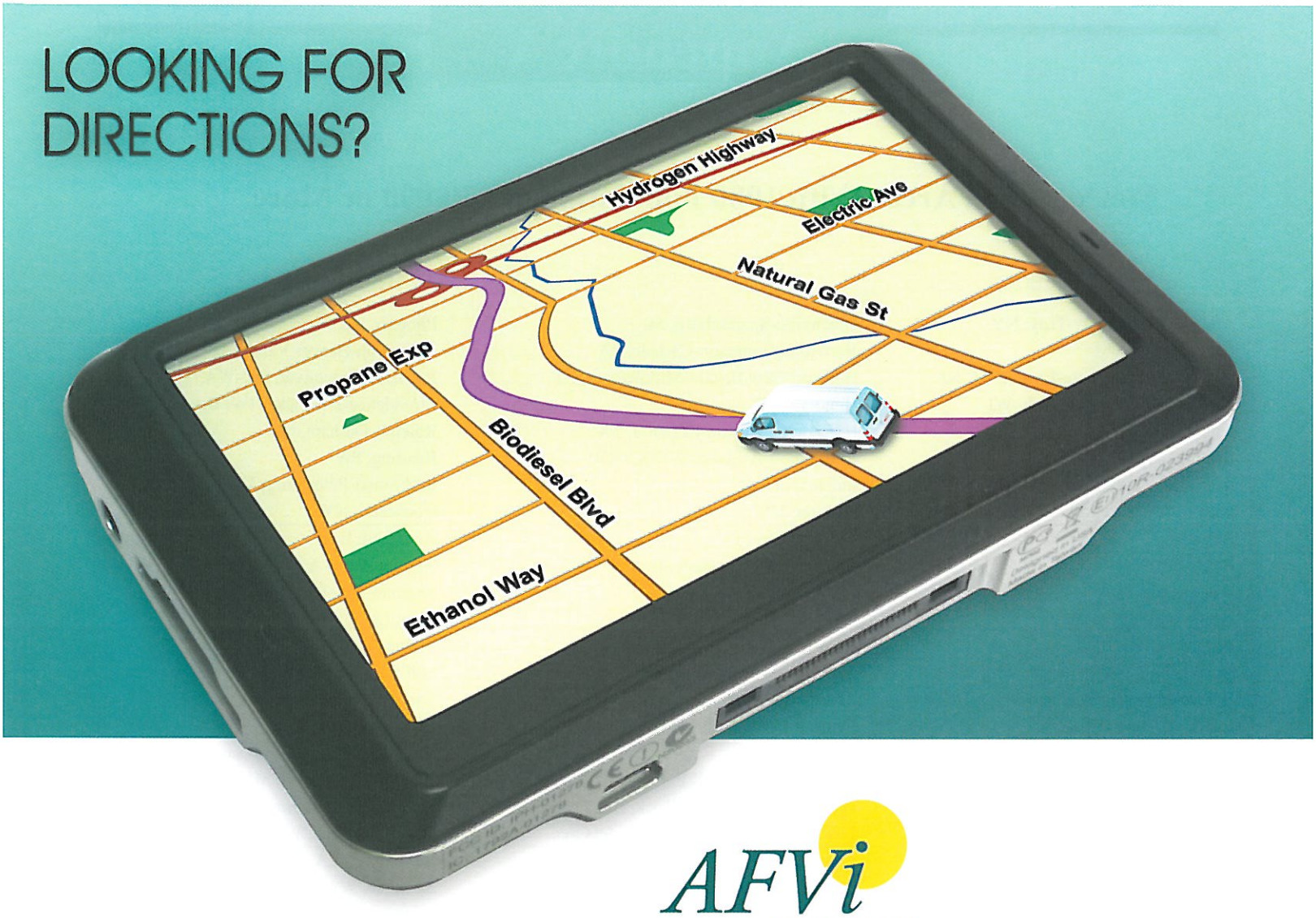
Vehicle Refueling Appliance: A natural gas fueling component that contains both compressor and fueling equipment. These appliances generally range in size from 1.75 to 5 cubic feet per minute.

Appendix A

Metropolitan Areas With 1980 Population of 250,000 or More

Albany-Schenectady-Troy, NY
Albequerque, NM
Allentown-Bethlehem-Easton, PA-NJ
Appleton-Oskhosh-Neenah, WI
Atlanta, GA
Atlantic City, NJ
Augusta, GA-SC
Austin, TX
Bakersfield, CA
Baltimore, MD
Baton Rouge, LA
Beaumont-Port Arthur, TX
Binghamton, NY
Birmingham, AL
Boston-Lawerence-Salem, MA-NH
Buffalo-Niagra Falls, NY
Canton, OH
Charleston, SC
Charleston, WV
Charlotte-Gastonia-Rock Hill, NC-SC
Chattanooga, TN-GA
Chicago-Gary-Lake County, IL-IN-WI
Cincinatti-Hamilton, OH-KY-IN
Cleveland-Akron-Lorain, OH
Colorado Springs, CO
Columbia, SC
Columbus, OH
Corpus Christi, TX
Dallas-Forth Worth, TX
Davenport-Rock Island-Moline, IA-IL
Dayton-Springfield, OH
Daytona Beach, FL
Denver-Boulder, CO
Des Moines, IA
Detroit-Ann Arbor, MI
Duluth, MN-WI
El Paso, TX
Erie, PA
Eugene-Springfield, OR
Evansville, IN-KY
Flint, MI
Fort Wayne, IN
Fresno, CA
Grand Rapids, MI
Greensboro-Winston Salem-High Point, NC
Greenville-Spartanburg, SC
Harrisburg-Lebanon-Carlisle, PA
Hartford-New Britain-Middletown, CT
Honolulu, HI
Houston-Galveston-Brazoria, TX
Huntington-Ashland, WV-KY-OH
Indianapolis, IN
Jackson, MS
Jacksonville, FL
Johnson City-Kingsport-Bristol, TN-VA
Johnstown, PA
Kansas City, MO-KS
Knoxville, TX
Lakeland-Winter Haven, FL
Lancaster, PA
Lansing-East Lansing, MI
Las Vegas, NV
Lexington-Fayette, KY
Little Rock- No. Little Rock, AR
Los Angeles-Anaheim-Riverside, CA
Louisville, KY-IN
Macon-Warner Robins, GA
Madison, WI
McAllen-Edinburg-Mission, TX
Melbourne-Titusville-Palm Bay, FL
Memphis, TN-AR-MS
Miami-Fort Lauderdale, FL
Milwaukee-Racine, WI
Minneapolis-St. Paul, MN-WI
Mobile, AL
Modesto, CA
Montgomery, AL
Nashville, TN
New Haven-Meriden, CT
New London-Norwich, CT-RI
New Orleans, LA
New York-New Jersey-Long Island, NY-NJ-CT
Norfolk-Virginia Beach-Newport News, VA
Oklahoma City, OK
Omaha, NE-IA
Orlando, FL
Pensacola, FL
Peoria, IL
Philadelphia-Wilmington-Trenton, PA-NJ-DE-MD
Phoenix, AZ
Pittsburgh-Beaver Valley, PA
Portland-Vancouver, OR-WA
Providence-Pawtucket-Fall River, RI-MA
Raleigh-Durham, NC
Reading, PA
Richmond-Petersburg, VA
Rochester, NY
Rockford, IL
Sacramento, CA
Saginaw-Bay City-Midland, MI
Saint Louis, MO-IL
Salinas-Seaside-Monterey, CA
Salt Lake City-Ogden, UT
San Antonio, TX
San Diego, CA
San Francisco-Oakland-San Jose, CA
Santa Barbara-Santa Maria-Lompoc, CA
Scranton-Wilkes-Barre, PA
Seattle-Tacoma, WA
Shreveport, LA
Spokane, WA
Springfield, MA
Stockton, CA
Syracuse, NY
Tampa-St. Petersburg-Clearwater, FL
Toledo, OH
Tuscon, AZ
Tulsa, OK
Utica-Rome, NY
Washington, DC-MD-VA
West Palm Beach-Boca Raton-Delray Beach, FL
Wichita, KS
Worcester, MA
York, PA
Youngstown-Warren, OH

LOOKING FOR DIRECTIONS?



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Information

NATURAL GAS: A CLEAN, ABUNDANT, AFFORDABLE AND AMERICAN ENERGY ALTERNATIVE

Natural Gas is Clean

- Natural gas is **the cleanest commercially available fuel for transportation today**.
- Compared to gasoline and diesel vehicles, Natural Gas Vehicles (NGVs) produce 93-95 percent fewer overall toxins and reduce greenhouse gas emissions by 20-30 percent.
- The natural gas fueled Civic GX produced by American Honda has been rated the "Greenest Vehicle" for five consecutive years by the American Council for an Energy-Efficient Economy.
- Converting one refuse truck from diesel to natural gas is the equivalent of taking as many as 325 cars off the road in terms of pollution reduction.

Natural Gas is Abundant

- Domestic reserves of natural gas are estimated to be twice that of petroleum based upon current consumption—approximately 100+ years.
- For 14 of the past 16 years, America has added more gas to its reserves than it has produced and used.
- Worldwide, **natural gas reserves are greater than petroleum**.

Natural Gas is Affordable

- Natural gas has been 25-34 percent cheaper than diesel over the past 14 years.
- Transit buses that use natural gas can expect an annual fuel cost savings of almost $20,000 when compared to conventional "clean diesel" buses, and more than $11,500 when compared with diesel-electric hybrid buses.
- **Natural gas costs, on average, over one-third less** than conventional gasoline at the pump.

Natural Gas is American

- **98 percent of all the natural gas consumed in America is produced in North America,** while 66 percent of the crude oil we use is imported.
- There are about 1,100 NGV fueling stations in the United States; more than half for public use.
- The necessary natural gas fuel distribution infrastructure is already in place—over 1.5 million miles of natural gas pipelines and distribution lines blanket the U.S., making supplies readily available for new fueling stations.

Natural Gas Vehicles are Widely Used

- Use of NGVs is widespread and growing—**there are approximately 110,000 NGVs on U.S. roads today and over 11 million worldwide.**
- More than 25 manufacturers produce 100 models of light-, medium- and heavy-duty natural gas vehicles and engines in the United States.
- In the United States, natural gas vehicles can be factory ordered from mainline manufacturers, including American Honda, American LaFrance-Condor, Autocar, Blue Bird, Thomas Built, Crane Carrier, Freightliner Custom Chassis, NABI, New Flyer, Optima, Orion, Ottawa, Capacity, Peterbilt, Sterling, Schwarze, Tymco, and Allianz-Johnston.
- Several manufacturers—Baytech, BAF, Emission Solutions Inc. and IMPCO – also offer warranted conversion (retrofits and repowers) of many popular light-, medium- and heavy-duty vehicle models made by GM, Ford, Isuzu, Workhorse and International.
- NGVs are used in a variety of fleets, including: taxi and shuttle services; food, beverage and other delivery businesses; refuse companies, **school bus fleets**; a wide variety of private and **public work trucks, such as sweepers, dump trucks and plows**; and transit buses. One-in-five (20 percent) of all new transit buses on order nationwide now are natural gas-powered.

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Potential CNG Vehicle Applications

	Cargo Van	Passenger Van	Medical Lab Courier	Step Van	Utility Crew Cab Truck	School Bus	Refuse Truck
GVWR (lbs)	>8,500-<14,000	>8,500-<14,000	<8,500	14,000-19,500	>26,000	>26,000	>26,000
Average Miles/yr	35,000		30,000	26,000-28,000	16,000-24,700	18,000	21,250-30,000
MPG							
City	13	13	19	5.0-6.5	3.5-4.75	6.0-7.0	2.5-3.0
Hwy	15	15	30	N/A	N/A	N/A	N/A
FUEL USE							
Per Day (gge) (dge)	8 to 10	16-19	4-6	13-16	15-20	N/A	35-40
Per Year (gge) (dge)	2,700-3,100	4,700-5,800	1,000-1,575	4,200-5,000	4,600-5,200	2,650	8,500-10,000
CNG Premium	$15,500	$15,000	$7,000	$29,000	$52,000	$37,000	$37,000
Life-Cycle Cost Savings (best case)	$9,300.00	$22,120.00	$5,600.00	$56,000.00	$36,400.00	$21,565.00	$99,000.00
Life-Cycle Cost Savings (worst case)	$6,100.00	$15,080.00	$1,000.00	$42,400.00	$26,200.00	N/A	$78,600.00
Simple Payback (yrs)(best case)	3.13	1.62	2.78	3.63	6.25	8.73	2.31
Simple Payback (yrs)(worst case)	3.59	1.99	4.38	4.32	7.07	N/A	2.72
Notes (Information based on national averages.)	Contractor using Ford E-350 passenger van or Chevy/GMC 3500 passenger van based on 5 year life.	Limo Svc. using Ford E-350 passenger van or Chevy/GMC 3500 passenger van; Most shuttles svcs run their veh. Up to 500K+ miles. Life cycle is based on a 4 year life.	Honda Civic GX. Life cycle cost is based on 5 year life.	75-90 miles driven per day @ 6 days per week; applications include bakery, snack food & linen deliveries. Workhorse W42 w/ GM 6.0L engine; Life cycle cost is based a 10 year life.	Int'l 4000 Series w/ ESI 7.6L NG; Freightliner M2 w/ CWI ISL-G; Life cycle is based on a 10 year life.	Blue Bird All American RE or Thomas Built Saf-T-Liner (both built w/ CWI ISL-G engines); Life cycle is based on a 13 year life.	Crane Carrier LET, Autocar Xpeditor, Peterbilt LCF 320, Int'l - Condor, Mack TerraPro Freightliner M2 (all w/ CWI ISL-G engine); Int'l w. ESI 7.6L. Life cycle is based on a 8 year life; Simple payback is 3.3 to 3.9 years if no tax credit is available.

Information provided from "The Compelling Case For NGVs in Public and Private Fleets" by Stephe Yborra, Director of Market Analysis, Education & Communications; Clean Vehicle Education Foundation/NGVAmerica (line indicating "100% 1st Yr. Deprc." modified

Life cycle costs are based on $1.60/GGE & $1.70/DGE savings and no grant funding.

Note: As of Dec. 2010, Congress enacted a new bonus depreciation provision that allows companies to expense 100% of the cost of new capital equipment during 2011. This provision extends to transportation equipment used to transport persons or goods.

Note: Pay backs are based business having a tax liability

Note: Life Cycle Advantage include vehicle premium cost.

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What Is the Cost of a CNG Station for My Fleet?*

Generic Examples

	Home owner	School bus – DGE	Delivery trucks – DGE	Transit buses – DGE
Number of Vehicles	1	4	20	60
Miles per year per vehicle	12,000	18,000	27,000	40,000
Vehicle MPG	30.0	6.5	5.75	4.0
Estimated gallons per year per vehicle	400	2,769	4,696	10,000
Estimated price per gasoline gallon	$3.58	$3.82	$3.82	$3.82
Estimated price per GGE CNG	$1.66	$1.77	$1.77	$1.77
Annual cost of gasoline	$1,432.00	$42,314.00	$358,748.00	$2,282,060.00
Annual cost of CNG	$664.00	$19,606.00	$166,226.00	$1,062,000.00
Potenital annual savings	**$768.00**	**$22,708.00**	**$92,522.00**	**$1,230,000.00**
Installed cost of CNG fueling appliance	$6,500.00	$140,000.00	$400,000.00	$2,250,000.00
Simple payback	**8.50**	**6.20**	**2.10**	**1.80**

	GGE	DGE	GGE Factor	DGE Factor
Tariff Gas Cost/MMBtu	$7.80	$7.80	8.0	7.2
Tariff Gas Cost GGE/DGE	$0.98	$1.08		
Elect. Compression Costs/GGE-DGE	$0.10	$0.10		
Mainten./Repair/Service Cost/GGE-DGE	$0.40	$0.40		
Capital Amortization Equip./GGE-DGE	$0.50	$0.50		
Fed. Motor Fuel Excise Tax/GGE-DGE	$0.183	$0.183		
Fed. Fuel Tax Credit/GGE-DGE	-$0.50	-$0.50		
Net GGE/DGE Fuel Cost	$1.66	$1.77		

**Totals reflect energy prices as of Aug. 2011*

GGE Gallon of gasoline equivelent
MPG Miles per gallon
DGE Gallon of diesel fuel equivelent
BTU British Thermal Unit
CNG Compressed natural gas

Source: Information provided by Natural Gas Vehicles for America

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Fleet Operator Transition Survey

Date	Business Name	
I. How many vehicle types are planned to be transitioned to CNG?		1. Cars:
2. Pick ups:	3. Transit Buses/Shuttles:	4. School Buses:
a. ½ Ton: b. ¾ Ton:	a. Light Duty:	b. Medium Duty:
	b. Medium Duty:	c. Heavy Duty:
	c. Heavy Duty:	
5. Other	Comments:	
II. How many miles per year per vehicle type?		1. Cars
2. Pick ups:	3. Transit Buses/Shuttles:	4. School Buses:
a. ½ Ton: b. ¾ Ton:	a. Light Duty:	a. Medium Duty:
	b. Medium Duty:	b. Heavy Duty:
	c. Heavy Duty:	
5. Other:	Comments:	
III. How many gallons of diesel or gasoline are consumed by vehicle type?		1. Cars:
2. Pick ups:	3. Transit Buses/Shuttles:	4. School Buses:
a. ½ Ton: b. ¾ Ton:	a. Light Duty:	a. Medium Duty:
	b. Medium Duty:	b. Heavy Duty:
	c. Heavy Duty:	
5. Other	Comments:	
III.a How many gallons per day per vehicle type?		1. Cars:
2. Pick ups:	3. Transit Buses/Shuttles:	4. School Buses:
a. ½ Ton: b. ¾ Ton:	a. Light Duty:	a. Medium Duty:
	a. Medium Duty:	b. Heavy Duty:
	b. Heavy Duty:	
5. Other	Comments:	
IV. What is the number of years/miles before each vehicle type it replaced?		1. Cars:
2. Pick ups:	3. Transit Buses/Shuttles:	4. School Buses:
a. ½ Ton: b. ¾ Ton:	a. Light Duty:	a. Medium Duty:
	a. Medium Duty:	b. Heavy Duty:
	b. Heavy Duty:	
5. Other:	Comments:	

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Fleet Operator Transition Survey

V. What type of fuel is used (diesel or gasoline) in each vehicle type?		1. Cars:
2. Pick ups:	3. Transit Buses/Shuttles:	4. School Buses:
a. ½ Ton: b. ¾ Ton:	a. Light Duty:	a. Medium Duty:
	a. Medium Duty:	b. Heavy Duty:
	b. Heavy Duty:	
5. Other:	Comments:	
VI. Where would you prefer to fuel your fleet? (check one)		
☐ Public Station	☐ Behind-Your-Own-Fence Station	
VII. If you opt for a "Behind-Your-Own-Fence" fueling station, would your fleet require:		
☐ Quick-fill application	☐ Combination quick-fill and time-fill	
VIII. If a time-fill application is opted, what hours is your fleet parked from the time a vehicle is parked until it is driven out the next day?		
IX. Will your property accommodate a 24'X 14' footprint for a station?		
☐ Yes	☐ No	
X. Do local Codes/Regulations allow for a NGV fueling station?		
☐ Yes	☐ No	
XI. Is 480 v/3 phase available at your potential fueling site?		
☐ Yes	☐ No	
XII. How many time-fill dispensers are needed to adequately fuel your fleet?		
XIII. How many quick-fill dispensers are needed to adequately fuel your fleet?		
XIV. Is your business tax-exempt?		
☐ Yes	☐ State	
☐ No	☐ Federal	
XV. What is your vehicle replacement plan? Number of vehicles by year.		
Additional Notes:		

CNG Fueling Facilities

P B Hoidale Co., Inc.
Richard Dixon, CEO
3801 W. Harry
P O Box 12104
Wichita, KS. 67277-2104
316-942-1361 ofc
316-942-0788 fax
rdixon@hoidale.com

Fuel Conversion Solutions, LLC
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816-500-2573 cell
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fuelconversionsolutions.com

J-W Power Company
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405-834-0869 cell
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bsteed@jwenergy.com

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a1united.net

IMW Industries, Inc.
Roger Conyers, Dir. Sales & Mktg.
P O Box 665
Clearfield, UT. 84089
801-773-2575 ofc
801-725-4257 cell
801-773-2950 fax

FuelMaster Fuel Mgmt. Sys.
Mike MacComiskey
507 SW Brome
Grain Valley, MO 64029
800-888-9136 ext. 1316 ofc
816-830-1414 cell
mmaccomiskey@syntech-fuelmaster.com
www.syntech-fuelmaster.com

Tulsa Gas Technologies, Inc.
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Tulsa, OK. 74146
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918-665-2657 cell
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tulsagastech.com

Zeit Energy
Patrick Zeiter, VP Eng. & Ops
5420 LBJ Freeway, Ste. 750
Dallas, TX. 75240
214-244-1926 ofc
zeitenergy.com
cngconnect.org

Advance Fuel Systems, Corp.
David G. Chacon, Dir. Mktg. & Sales
11013 Woodstock St. # 664
Huntly, IL 602142
866-725-0801, ext. 704 off
www.advancefuelsystems.com
david.chacon@advancefuelsystems.com

Midwest Energy Solutions
Mike Batten, President
ANGI Compressor Rep.
Kansas City, MO
816-532-4750 ofc
816-519-9850 cell
mikeb@mwes4u.com
www.mwes4u.com

Chart Inc.
Amato Spagnoletti, VP Sales
Distribution & Storage
178 Church St.
Ramsey, NJ 07446
800-400-4683 ofc
201-328-3165 fax
551-804-8850 cell
amato.spagnoletti@chart-ind.com
www.chart-ind.com

Greenfield Compression
Mike Conti, Sales Mgr.
Compressors & Dispensers
909 N. Bowser Road
Richardson, TX 75081
972-889-2400, ext 174 ofc
972-234-4829 fax
214-707-0295 cell
mike.conti@us.atlascopco.com
www.greenfieldcompression.com

Great Plains Gas Compression Inc.
Terry McBride, VP, Sales/Mktg.
Compressors
210 East 1st Street
Hugoton, KS 67951
620-544-4191 ofc
620-544-4141 fax
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tmcbride@greatplainsgas.com

The Gas Connection
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rconyers@imw.ca
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Kirk Energy Group
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419-423-1000 ofc
419-422-5588 fax
419-721-4436 cell

arill@kirkenergy.com
www.kirkenergy.com

NatGasServices, LC
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110 SE Grant St., ste 205
Ankeny, IA 50021
515-964-6799 ofc
515-964-6704 fax
641-629-0552 cell

www.natgasservices.com

Small Arrow Engr'g, LLC
John H. Bolte, PE; Principal
CNG Station Designer
216 S. Main Street
Joplin, MO 64802
417-624-2333 ofc
417-624-2441 fax
417-291-5530 cell

jbolte@small-arrow.com
www.small-arrow.com

CNG, LNG Vehicle Conversions

Altech-Eco
Mike Cerven, Sales Rep.
101 Fair Oaks Rd.
Arden, NC. 28704
828-654-8300 ext 122 ofc
704-929-3402 cell
828-654-8747 fax
mike.cerven@altecheco.com
altecheco.com

Carter Chevrolet Agency, LLC
Tim Turner, Fleet Sales
215 W. Oklahoma Ave.
Okarche, OK. 73762
405-263-7252 ofc
405-298-0065 cell
405-263-7259 fax
turnersales@carterchev.biz
oemsystems.net

Fuel Conversion Solutions
Mike Corrigan
402-718-5896
mike@fuelconversionsolutions.com

Husker Automotive, Inc.
Tom Malone, President
1421 Centerpark Rd.
Lincoln, NE. 68512
402-423-7711

Natural Gas Vehicles Texas, Inc.
Marci Millender, Ops. Mgr.
Love Field Comm. Center
6334 Maple Ave., ste. 350
Dallas, TX 75235
214-630-1000 ofc
817-466-6204 cell
214-637-1000 fax
marci@ngvtexas.com
www.ngvtexas.com

BAF
Robert J. Sessa, Western Reg. Sales Mgr.
2327 Beatrice St.
Dallas, TX 75208
ofc
828-772-0394 cell
949-831-1010 fax
rsessa@BAFtechnologies.com
www.BAFTechnologies.com

Creative Bus Sales
Tony Matijevich, President
13501 Benson Ave.
Chino, CA
909-465-5528 ofc
714-469-4777 cell
909-465-5529 fax
tonym@creativebussales.com
www.creativebussales.com

FuelTek Conversion Corp.
Wes Biggers, President
5660 E. 58th Ave, Unit B
Commerce City, CO 80022
720-941-2791 ofc
cell
720-941-4071 fax
wbiggers@fueltek.biz
www.fueltek.biz

Key Equipment & Supply Co.(HD CNG Veh.)
Tom Wyant, Mgr.
PO Box 11035
Kansas City, KS 66111
800-262-0149 ofc
913-915-7801 cell
913-788-4093 fax
tomw@keyequipment.com
www.facebook.com/keyequipment

O'Daniel Honda
Matt O'Daniel, GM
78th & Dodge
Omaha, NE
402-393-7801 ofc
cell
402-827-8409 fax
mattodaniel@odanielhonda.com
www.odanielhonda.com

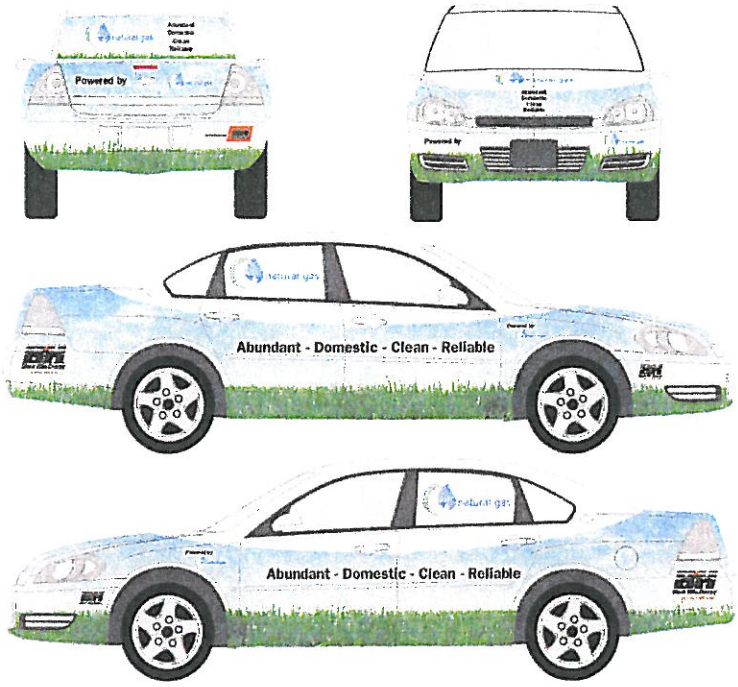
PP Environmental, LLC (CNG/Diesel Blend'g kits)
Dennis R. Petersen, Dir.
4301 Quebec Ave. N.
New Hope, MN
763-533-6070 ofc
612-462-2736 cell
763-533-6971 fax
Dennis@LPPEnvironmental.com

Luxfer Gas Cylinders
Dave Myers, Sales Mgr.
3016 Kansas Avenue
Riverdale, CA 92507-2289
951-341-2289 ofc
714-747-6662 cell
951-328-2725 fax
dave.myers@luxfer.net
www.luxfercylinders.com

Lincoln Composites Gas Cylinders
Brock Peterson, Mgr. Bus. Dev.
5117 NW 40th Street
Lincoln, NE 68524
402-470-5000 ofc
402-304-3014 cell
402-470-0019 fax
bpeterson@lincolncomposites.com
www.lincolncomposites.com

Midwest Bus Sales, Inc.
Scott Kincaid, Mgr.
313 E. Front St.
Bonner Springs, KS 66012
913-422-1000 ofc
cell
913-422-8007 fax
dsk@midwestbussales.com

Scholfield Honda
Sebastian Zahr, Altern. Fuel Mgr.
7017 E. Kellogg
Wichita, KS 67207
316-688-6400 ofc
316-655-4243 cell
316-688-6520 fax
sebastian_zahr@scholfield.com
www.scholfieldhonda.com



ChevC_03 Chevrolet Impala
Back Windshield Size 32.3 x 50 3
1/20th Scale

BLACK HILLS ENERGY

Tim Hess, Gas Marketing Manager
2330 No. Hoover
Wichita, KS 67205
o. (316) 941-1653
c. (316) 734 - 1983

NATURAL GAS VEHICLE WEB SITES (3/3/11)

http://www.ngvamerica.org/pdfs/FAQs_Converting_to_NGVs.pdf

http://fleetowner.com/about/fleetseek-walkthrough.pdf

http://www.fleetsandfuels.com/

http://www.naturaldrive.com/component/option,com_frontpage/Itemid,1/

http://find.mapmuse.com/directory/cng

http://www.afvi.org/

http://wasteage.com/Trucks_And_Bodies/waste_smoother_road/

http://research.missouri.edu/news/stories/070216_naturalgas.htm

http://www.iowacleancities.org/

http://www.dteenergy.com/businessCustomers/productsPrograms/gas/natGasVehicle.html
Woody

http://www.ngvglobal.com/

http://www.prochoicecng.com/

http://www.ngvamerica.org/

http://www.tesla-tech.com/index.htm

http://www.iangv.org/business-directory.html

http://www.cngoutfitters.com/

http://video.google.com/videoplay?docid=5245624839807682996&pr=goog-sl#

Guide to
Available Natural Gas Vehicles and Engines

a listing of
Light-, Medium- and Heavy-Duty Vehicles and/or Engines
available directly from
Original Equipment Manufacturers (OEM)
or via Qualified System Retrofitters Using EPA-/CARB-Certified Systems
from Small Volume OEMs (SVM)

Updated 5-14-2011

Read page 2 "How to Use This Guide" before proceeding further

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How to Use This Guide

On the following pages, NGVAmerica has assembled information about vehicles and/or engines that have been certified by the US Environmental Protection Agency (EPA) and/or California Air Resources Board (CARB) to operate on natural gas, either as (1) dedicated vehicles - *spark-ignited engine operates on natural gas only* , (2) bi-fuel vehicles - *spark-ignited engine operates on either compressed natural gas (CNG) or gasoline, but not both at same time,* or (3) dual-fuel vehicles - *compression-cycle engine operates primarily on natural gas but uses diesel as ignition "pilot"* *

Generally, CARB's certification procedure imposes more testing and documentation requirements for both new-vehicle and aftermarket engine-retrofit ("conversion") systems than EPA, although both CARB and EPA have similar emissions and on-board diagnostics (OBD) compliance requirements. Other differences between the two sets of standards is that EPA classifies vehicles under 8500 pounds GVW as light duty and those over as heavy-duty while CARB's light duty classification goes up to 10,000 pounds. While most states require only EPA certification of new vehicles and aftermarket retrofit systems, a growing number of states are opting to adopt CARB standards for sale and/or registration of new vehicles. Check with your state officials to determine whether CARB standards for aftermarket retrofit systems have been adopted in your state; otherwise EPA standards apply.

This Guide's list of light -duty vehicles includes those manufactured at the factory by traditional Original Equipment Manufacturers (OEMs), and those retrofit with EPA- or CARB-certified engine systems after leaving the factory using systems made by Small Volume Original Equipment Manufacturers (SVMs). Furthermore, SVM engine retrofit systems may be installed before placing the vehicle into active service or afterward. System installations are usually handled by the SVMs themselves or their Qualified System Retrofitters. Note that, unlike the unregulated "conversion kits" that were available from dozens of manufacturers in the late-1970s through the mid-1990s, all gaseous fuel engine systems on the market today are engineered and tested to comply with the same tough CARB and/or EPA emissions performance requirements as the large automobile manufacturers.

Also note that EPA and CARB certifications of light-duty vehicle retrofit systems are for specific model years and installation time-periods. Basedon recently isued EPA guidance, SVMs may continue to retrofit vehicles for which they have certifications even after the ACTIVE CERTIFICATION period has expired. The charts starting on page 3 do not show certifications prior to 2008and, for some, even this MY has been struck as these SVMs cannot or will not sell systems for vehicles that old - assuming that these vehicles have accumulated significant mileage (over 20K), teh point at which most SVMs will not retofit a vehicle even if they have an active certification on file. **Some SVMs also hold certifications from <u>previous</u> years. Those interested in converting an existing vehicle should check with the SVMs about whether these prior year certified systems are available.**

*When new engines are EPA- or CARB-certified to run on hydrogen (H2) or hydrogen-CNG blends (generically referred to as "HCNG"), these engines will be added to the listing. As of this revision of the guide (see date above), H2 and HCNG engines were being tested/monitored in various field RD&D trials but none had yet been certified for general commercial sale.

Engine/Vehicle Certifications (Vehicles over 14,000# GVWR)

BAF Technologies (See also - chart of vehicles up to 14,000# for more BAF Technologies retrofit system certifications)

6.8L V-10 (spark-ignited)	Dedicated CNG retrofit of Ford gasoline engine with active CARB/EPA certifications for: MY '09/10/11 E450 cutaway chassis (e.g., for shuttles, box trucks); EPA/CARB certified MY10/11 F450 and F550 heavy-duty utility truck chassis; F53/F59 strip chassis (e.g. for walk-in vans, etc)

IMPCO Technologies — **See Light-Duty Vehicle charts for additional listings by IMCPO Technologies**

4.8L HD (spark-ignited)	Dedicated (CARB/EPA) and Bi-Fuel (EPA) CNG retrofit of MY11 Workhorse W42 walk-in van chassis (over 14,000#);
6.0L HD (spark-ignited)	Dedicated (CARB/EPA) and Bi-Fuel (EPA) CNG MY '09/10 Chevrolet W4500 "cab-over" truck chassis; MY 09/10/11 Isuzu NPR and NPR HD "cab-over" truck chassis; Workhorse MY'09/10 W42 and MY11 W62 and P30 walk-in van chassis (over 14,000#); Freightliner Custon Chassis MT45 walk-in chassis; Dedicated CNG (CARB/EPA) and Bi-Fuel CNG (EPA) MY10 Chevrolet W4500 "cab-over" truck chassis; Isuzu NPR HD "cab-over" truck chassis; Workhorse MY10 W42 and MY11 W62 walk-in van chassis (over 14,000#). MY '09/10/11 G4500 cutaway (e.g., shuttles, etc)

Landi Renzo USA/Baytech — **See Light-Duty Vehicle charts for additional listings by Landi Renzo Usa/Baytech**

4.8L HD (spark-ignited)	Dedicated (CARB/EPA) and Bi-Fuel (EPA) CNG retrofit of MY11 Workhorse W42 walk-in van chassis (over 14,000#);
6.0L HD (spark-ignited)	Dedicated (CARB/EPA) and Bi-Fuel (EPA) CNG MY '09/10 Chevrolet W4500 "cab-over" truck chassis; MY 09/10/11 Isuzu NPR and NPR HD "cab-over" truck chassis; Workhorse MY'09/10 W42 and MY11 W62 and P30 walk-in van chassis (over 14,000#); Freightliner Custon Chassis MT45 walk-in chassis; Dedicated CNG (CARB/EPA) and Bi-Fuel CNG (EPA) MY10 Chevrolet W4500 "cab-over" truck chassis; Isuzu NPR HD "cab-over" truck chassis; Workhorse MY10 W42 and MY11 W62 walk-in van chassis (over 14,000#). MY '09/10/11 G4500 cutaway (e.g., shuttles,box trucks); MY10/11 Bremach work truck
8.1L (spark-ignited)	Dedicated CNG and Bi-Fuel (CARB/EPA) retrofit certifications covering MY '08, '09 C4500/5500 cutaway chassis; C4500/5500/6500/7500/8500 Topkick/Kodiak conventional truck chassis, Workhorse W62 walk-in van chassis. Dedicated CNG (CARB/EPA) and Bi-Fuel (EPA) MY'10 C4500/5500 cutaway chassis; C4500/5500/6500/7500/8500 Topkick/Kodiak conventional truck chassis. Workhorse W62 walk-in van chassis. GM discontinued sales/manufacturing of this engine in 2009, although as-yet-unsold and/or low-mileage models may still be retrofitted Contact Landi Renzo USA/Baytech regarding potential availability for larger orders.

Cummins Westport Inc

8.9L ISL G (spark-ignited)	Dedicated natural gas engine based on Cummis ISL diesel platform, 2010-compliant (.2 NOx and .01PM); HP ratings of 250, 260, 280, 300, 320; 660-1000 ft lbs torque. Available in: Low Cab Forward (LCF) refuse trucks by Peterbilt, Crane-Carrier, Autocar, American LaFrancel-Condor and Mack (and most refuse body builders); Type D/4 school buses by Thomas Built (Saf-T-Liner HDX) and Blue Bird (All American RE); transit buses by New Flyer, NABI, Gillig, Orion and Foton; work trucks by Freightliner (M2 tractors and M2 112 straight trucks; SD 114 work truck), Kenworth (T440, T470; W900S), Peterbilt (365 work truck, 384 tractor); port "yard hostlers" by Capacity. Generally, CWI does not repower existing diesel vehicles, and instead, sells thru bus and truck OEMs and their dealers. There are exceptions to this general rule including some transit applications - contact your regional Cummins distributor or your CWI regional sales manager for more information.

Doosan Infracore America

11L GK12 Spark-ignited	Dedicated natural gas engine manufactured by Doosan rated at 290 HP/905 ft-lb torque; 2010 compliant using SCR with DPF. Currently available as repower option for transit, refuse and other HD applications

Emission Solutions Inc/International truck

7.6L NG Phoenix (spark ignited)	Dedicated natural gas engine based on International DT466 (#308 12-valve) diesel platform; EPA-/CARB-certified 2010-compliant at .2NOx and .01PM; 260 HP, 900 ft-lb torque; Engine/fuel system change-out for existing 1994-2003 diesel International DT466-equipped school buses, medium-/medium-heavy-duty and heavy-duty cutaway shuttles and work trucks. Also EPA-/CARB-certified 2010-compliant for repower of International MaxxForce DT (#316, #326 24-valve) version of same engine with 300Hp and 860 ft.-lb torque. Now available through International dealers on MaxxForce DT-equipped WorkStar 7300/7400 platforms and (coming in July 2011) on DuraStar 4300/4400 trucks

Westport Innovations

15L GX (compression ignition engine)	Based on Cummins ISX diesel platform, this dual-fuel High Pressure Direct Injection (HPDI) system engine runs primarily on natural gas (90-99%) with diesel pilot fuel (1-10%); CARB/EPA-certified, available up to 475Hp configuration for HD work truck and line-haul applications including OEM availability from Paccar (Kenworth T800 and Peterbilt 386 and 367 tractors);

Spark-Ignited Natural Gas (SING) Vehicles Up to 10,000# (EPA) or 14,000# (CARB)

(Contact SVM for Availabilities of Systems and Minimum Purchase Requirements for Previous Models Years)

(Engine/vehicle listings below refer to EPA and/or CARB certificate holders; some companies listed below may also install other SVM's systems)

Original Equipment Manufacturer (OEM) Vehicles (FACTORY-BUILT: NOT A CONVERSION - NO CONVERSIONS AVAILABLE)

Engine	Make		Model	EPA/ CARB	Model Year(s)
Honda 1.8L	Honda	Dedicated	Civic GX	E/C	97-10
GM 6.0L	GM	Dedicated	Chevy Express/GMC Savana Cargo van	E/C	11
Ford 4.6L	VPG	Dedicated	MV-1 Wheelchair accessible sedan	E/C	10/11

Small Volume OEM (SVM) Vehicles (CONVERSIONS VIA SVMs AND/OR THEIR QUALIFIED SYSTEM RETROFITTERS)

Engine	Make	Bi-Fuel/ Dedicated	Model	Landi Renzo USA/ Baytech		BAF Technologies		IMPCO Technologies		Altech-Eco		NGV Motori/ NGV Conversions		NatGas Car		GoNatural CNG		CNG Store dba Auto Gas Store		High Pressure Group	
				EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)
Chrys.4.7L	Dodge	Bi-Fuel	Ram 1500 pick-up truck											E	10/11						
Chrys.4.7L	Dodge	Dedicated	Ram 1500 pick-up truck											E	10/11						
Chrys.4.7L	Dodge	Bi-Fuel	Dakota pick-up truck											E	10/11						
Chrys.4.7L	Dodge	Dedicated	Dakota pick-up truck											E	10/11						
Chrys.4.7L	Mitsubishi	Bi-Fuel	Raider pick-up truck											E	10/11						
Chrys.4.7L	Mitsubishi	Dedicated	Raider pick-up truck											E	10/11						
GM3.5L	Chevy	Bi-Fuel	Impala					E	09/10												
GM3.5L	Chevy	Dedicated	Impala (LS,LT, LTZ, police and taxi pkgs)					E	08/09/10/11											E	09
GM3.5L	Chevy	Dedicated	Malibu					E	09/10/11											E	09
GM3.5L	Pontiac	Dedicated	G6*					E	09/10											E	09
GM3.9L	Buick	Bi-Fuel	Lucerne					E	10												
GM3.9L	Buick	Dedicated	Lucerne					E	09/10/11												
GM3.9L	Chevy	Bi-Fuel	Impala					E	09/10												
GM3.9L	Chevy	Dedicated	Impala (LS,LT, LTZ, police and taxi pkgs)					E	09/10/11											E	09
GM4.8L	Chevy	Bi-Fuel	Express Pasenger/Cargo Van G/H1500					E	11									E	10		
GM4.8L	Chevy	Bi-Fuel	Express Passenger/Cargo Van G2500/3500	E	09																
GM4.8L	Chevy	Dedicated	Express Passenger/Cargo Van G2500/3500	E/C	09/10/11			E	09/10/11												
GM4.8L	Chevy	Bi-Fuel	Silverado C/K1500 2WD/4WD pick-up					E	10/11									E	10		
GM4.8L	Chevy	Dedicated	Silverado C/K1500 2WD/4WD pick-up					E	08/09/10/11												
GM4.8L	Chevy	Bi-Fuel	Silverado C/K2500 2WD/4WD pick-up	E	09/10																
GM4.8L	Chevy	Dedicated	Silverado C/K2500 2WD/4WD pick-up																		
GM4.8L	Chevy	Bi-Fuel	Tahoe C1500 2WD/4WD					E	11									E	10		
GM4.8L	Chevy	Dedicated	Tahoe C1500 2WD/4WD					E	08/09												
GM4.8L	GMC	Bi-Fuel	Savana Passenger/Cargo Van G/H1500					E	11									E	10		

Continued on next page

Spark-Ignited Natural Gas (SING) Vehicles Up to 14,000#

(Contact SVM for Availabilities of Systems and Minimum Purchase Requirements for Previous Models Years)

(Engine/vehicle listings below refer to EPA and/or CARB certificate holders; some companies listed below may also install other SVM's systems)

Small Volume OEM (SVM) Vehicles (continued) (CONVERSIONS VIA SVMs AND/OR THEIR QUALIFIED SYSTEM RETROFITTERS)

Engine	Make		Model	Landi Renzo USA/ Baytech		BAF Technologies		IMPCO Technologies		Altech-Eco		NGV Motor/ NGV Conversions		NatGas Car		GoNatural CNG		CNG Store dba Auto Gas Store		High Pressure Group	
				EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)
GM4.8L	GMC	Bi-Fuel	Savana passenger/Cargo Van G2500/3500	E	09																
GM4.8L	GMC	Dedicated	Savana passenger/Cargo Van G2500/3500	E/C	09/10/11			E	09/10/11												
GM4.8L	GMC	Bi-Fuel	Sierra C/K 1500 2WD/4WD					E	10/11									E	10		
GM4.8L	GMC	Dedicated	Sierra C/K 1500 2WD/4WD					E	08/09/10/11												
GM4.8L	GMC	Bi-Fuel	Sierra C/K 2500 2WD/4WD	E	09/10																
GM4.8L	GMC	Dedicated	Sierra C/K 2500 2WD/4WD																		
GM4.8L	GMC	Bi-Fuel	Yukon C1500 2WD					E	11									E	10		
GM4.8L	GMC	Dedicated	Yukon C1500 2WD					E	08/09												
GM4.8L	Isuzu	Dedicated	NPR cab-over truck chassis (up to 14,000#)					E/C	11												
GM4.8L	Workhorse	Dedicated	W42 walk-in/step-van truck (up to 14,000#)					E/C	11												
GM5.3L	Chevy	Bi-Fuel	Silverado C/K1500 2WD/4WD pick-up					E	09/10/11									E	10		
GM5.3L	Chevy	Dedicated	Silverado C/K1500 2WD/4WD pick-up					E	08/09/10/11												
GM5.3L	Chevy	Bi-Fuel	Tahoe C/K1500 2WD/4WD					E	09/10/11									E	10		
GM5.3L	Chevy	Dedicated	Tahoe C/K1500 2WD/4WD					E	08/09/10/11												
GM5.3L	Chevy	Bi-Fuel	Avalanche C/K1500 2WD/4WD					E	09/10/11									E	10		
GM5.3L	Chevy	Dedicated	Avalanche C/K1500 2WD/4WD					E	08/09/10/11												
GM5.3L	Chevy	Bi-Fuel	Suburban C/K1500 2WD/4WD					E	09/10/11									E	10		
GM5.3L	Chevy	Dedicated	Suburban C/K1500 2WD/4WD					E	08/09/10/11												
GM5.3L	Chevy	Dedicated	Colorado 2WD/4WD					E	08/09												
GM5.3L	Chevy	Dedicated	Colorado Crew Cab 2WD/4WD					E	08/09												
GM5.3L	Chevy	Bi-Fuel	Express Passenger/Cargo Van G/H1500					E	10/11									E	10		
GM5.3L	Chevy	Dedicated	Express Passenger/Cargo Van G1500					E	08/09/10/11												
GM5.3L	GMC	Bi-Fuel	Sierra C/K 1500 2WD/4WD					E	09/10/11									E	10		
GM5.3L	GMC	Dedicated	Sierra C/K 1500 2WD/4WD					E	08/09/10/11												
GM5.3L	GMC	Bi-Fuel	Yukon C/K1500 2WD/4WD					E	09/10/11									E	10		
GM5.3L	GMC	Dedicated	Yukon C/K1500 2WD/4WD					E	08/09/10/11												
GM5.3L	GMC	Bi-Fuel	Yukon XL C/K1500 2WD/4WD					E	09/10/11									E	10		
GM5.3L	GMC	Dedicated	Yukon XL C/K1500 2WD/4WD					E	08/09/10/11												
GM5.3L	GMC	Dedicated	Canyon 2WD/4WD					E	08/09												
GM5.3L	GMC	Dedicated	Canyon Crew Cab 2WD/4WD					E	08/09												
GM5.3L	GMC	Bi-Fuel	Savanna Passenger/Cargo Van G/H1500					E	10/11									E	10		
GM5.3L	GMC	Dedicated	Savanna Passenger/Cargo Van G1500					E	08/09/10/11												
GM5.3L	Hummer	Dedicated	H3 4WD					E	08/09												
GM6.0L	Chevy	Bi-Fuel	Express Passenger/Cargo Van G1500					E	08												
GM6.0L	Chevy	Bi-Fuel	Express Passenger/Cargo Van G2500	E	09			E	08/09/11												
GM6.0L	Chevy	Dedicated	Express Passenger/Cargo Van G2500	E/C	09/10/11			E	09/10												
GM6.0L	Chevy	Bi-Fuel	Express Passenger/Cargo Van G3500	E	09			E	08/09/11												

Continued on next page

Spark-Ignited Natural Gas (SING) Vehicles Up to 14,000#

(Contact SVM for Availabilities of Systems and Minimum Purchase Requirements for Previous Models Years)

(Engine/vehicle listings below refer to EPA and/or CARB certificate holders; some companies listed below may also install other SVM's systems)

Small Volume OEM (SVM) Vehicles (continued) (CONVERSIONS VIA SVMs AND/OR THEIR QUALIFIED SYSTEM RETROFITTERS)

Engine	Make		Model	Landi Renzo USA/ Baytech		BAF Technologies		IMPCO Technologies		Altech-Eco		NGV Motori/ NGV Conversions		NatGas Car		GoNatural CNG		CNG Store dba Auto Gas Store		High Pressure Group	
				EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)
GM6.0L	Chevy	Dedicated	Express Passenger/Cargo Van G3500	E/C	09/10/11			E	09/10												
GM6.0L	Chevy	Bi-Fuel	Express Cutaway G3500	E	09/10																
GM6.0L	Chevy	Dedicated	Express Cutaway G3500	E/C	09/10																
GM6.0L	Chevy	Bi-Fuel	Express Cutaway G4500 (14,200# GVWR)	E/C (09)	09/10																
GM6.0L	Chevy	Dedicated	Express Cutaway G4500 (14,200# GVWR)	E/C	09/10																
GM6.0L	Chevy	Bi-Fuel	Silverado C/K1500 2WD/4WD pick-up					E	08												
GM6.0L	Chevy	Bi-Fuel	Silverado C/K2500 2WD/4WD pick-up	E	09/10			E	08/09/10/11												
GM6.0L	Chevy	Dedicated	Silverado C/K2500 2WD/4WD pick-up	E/C	09/10			E	09/10												
GM6.0L	Chevy	Bi-Fuel	Silverado C/K3500 2WD/4WD pick-up	E	09/10			E	08/09/10/11												
GM6.0L	Chevy	Dedicated	Silverado C/K3500 2WD/4WD pick-up	E/C	09/10			E	09/10												
GM6.0L	Chevy	Bi-Fuel	Silverado C/K2500 HD 2WD/4WD cab-chassis	E	09/10			E	09/10/11												
GM6.0L	Chevy	Dedicated	Silverado C/K2500 HD 2WD/4WD cab-chassis	E/C	09/10			E	09/10												
GM6.0L	Chevy	Bi-Fuel	Silverado C/K3500 HD 2WD/4WD cab-chassis	E	09/10			E	09/10/11												
GM6.0L	Chevy	Dedicated	Silverado C/K3500 HD 2WD/4WD cab-chassis	E/C	09/10			E	09/10												
GM6.0L	Chevy	Bi-Fuel	W3500 cab-over truck chassis	E	09/10/11																
GM6.0L	Chevy	Dedicated	W3500 cab-over truck chassis	E/C	09/10/11																
GM6.0L	GMC	Bi-Fuel	Savana Passenger/Cargo Van G1500					E	08												
GM6.0L	GMC	Bi-Fuel	Savana Passenger/Cargo Van G2500	E	09			E	08/09/11												
GM6.0L	GMC	Dedicated	Savana Passenger/Cargo Van G2500	E/C	09/10/11			E	09/10												
GM6.0L	GMC	Bi-Fuel	Savana Passenger/Cargo Van G3500	E	09			E	08/09/11												
GM6.0L	GMC	Dedicated	Savana Passenger/Cargo Van G3500	E/C	09/10/11			E	09/10												
GM6.0L	GMC	Bi-Fuel	Savana Cutaway G3500	E	09/10																
GM6.0L	GMC	Dedicated	Savana Cutaway G3500	E/C	09/10																
GM6.0L	GMC	Bi-Fuel	Savana Cutaway G4500 (14,200# GVWR)	E/C (09)	09/10																
GM6.0L	GMC	Dedicated	Savana Cutaway G4500 (14,200# GVWR)	E/C	09/10																
GM6.0L	GMC	Bi-Fuel	Sierra C1500HD					E	08												
GM6.0L	GMC	Bi-Fuel	Sierra C/K2500 2WD/4WD pick-up	E	09/10			E	08/09/10/11												
GM6.0L	GMC	Dedicated	Sierra C/K2500 2WD/4WD pick-up	E/C	09/10			E	09/10												
GM6.0L	GMC	Bi-Fuel	Sierra C/K3500 2WD/4WD pick-up	E	09/10			E	08/09/10/11												
GM6.0L	GMC	Dedicated	Sierra C/K3500 2WD/4WD pick-up	E/C	09/10			E	09/10												
GM6.0L	GMC	Bi-Fuel	Sierra C/K2500HD 2WD/4WD cab-chassis	E	09/10			E	09/10/11												
GM6.0L	GMC	Dedicated	Sierra C/K2500HD 2WD/4WD cab-chassis	E/C	09/10			E	09/10												
GM6.0L	GMC	Bi-Fuel	Sierra C/K3500HD 2WD/4WD cab-chassis	E	09/10			E	09/10/11												
GM6.0L	GMC	Dedicated	Sierra C/K3500HD 2WD/4WD cab-chassis	E/C	09/10			E	09/10												
GM6.0L	GMC	Bi-Fuel	W3500 cab-over truck chassis	E	09/10																
GM6.0L	GMC	Dedicated	W3500 cab-over truck chassis	E/C	09/10/11																
GM6.0L	Isuzu	Bi-Fuel	NPR cab-over truck chassis (up to 14,000#)	E	09/10																

Continued on next page

Spark-Ignited Natural Gas (SING) Vehicles Up to 14,000#

(Contact SVM for Availabilities of Systems and Minimum Purchase Requirements for Previous Models Years)

(Engine/vehicle listings below refer to EPA and/or CARB certificate holders; some companies listed below may also install other SVM's systems)

Small Volume OEM (SVM) Vehicles (continued) (CONVERSIONS VIA SVMs AND/OR THEIR QUALIFIED SYSTEM RETROFITTERS)

Engine	Make		Model	Landi Renzo USA / Baytech		BAF Technologies		IMPCO Technologies		Altech-Eco		NGV Motori/ NGV Conversions		NatGas Car		GoNatural CNG		CNG Store dba Auto Gas Store		High Pressure Group	
				EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)
GM6.0L	Isuzu	Dedicated	NPR cab-over truck chassis (up to 14,000#)	E/C	09/10/11			E/C	11												
GM6.0L	Workhorse	Bi-Fuel	W42 walk-in/step-van truck (up to 14,000#)	E	09/10																
GM6.0L	Workhorse	Dedicated	W42 walk-in/step-van truck (up to 14,000#)	E/C	09/10/11			E/C	11												
GM6.0L	Workhorse	Dedicated	W62 walk-in/step-van truck (up to 14,000#)	E/C	11			E/C	11												
GM6.2L	Cadillac	Bi-Fuel	Escalade 2WD/AWD															E	10		
Ford2.0L	Ford	Bi-Fuel	Focus							E	09/10										
Ford2.0L	Ford	Dedicated	Focus							E	09/10	E	09								
Ford2.0L	Ford	Bi-Fuel	Transit Connect							E	10										
Ford2.0L	Ford	Dedicated	Transit Connect					E	11	E	10										
Ford2.3L	Ford	Bi-Fuel	Fusion							E	09										
Ford2.3L	Ford	Dedicated	Fusion							E	09										
Ford2.3L	Mercury	Bi-Fuel	Milan							E	09										
Ford2.3L	Mercury	Dedicated	Milan							E	09										
Ford2.5L	Ford	Bi-Fuel	Fusion							E	10										
Ford2.5L	Ford	Dedicated	Fusion							E	10										
Ford2.5L	Mercury	Bi-Fuel	Milan							E	10										
Ford2.5L	Mercury	Dedicated	Milan							E	10										
Ford4.6L	Ford	Dedicated	F-150 pick-up truck							E	10										
Ford4.6L	Ford	Dedicated	Crown Victoria			E/C	09/10														
Ford4.6L	Lincoln	Dedicated	Town Car			E/C	09/10														
Ford4.6L	Mercury	Dedicated	Grand Marquis			E/C	09/10														
Ford5.4L	Ford	Bi-Fuel	Expedition					E	09/10												
Ford5.4L	Ford	Dedicated	Expedition			E/C	09/10									E	10/11				
Ford5.4L	Ford	Bi-Fuel	F 150 pick-up + cab-chassis					E	09/10												
Ford5.4L	Ford	Dedicated	F 150 pick-up + cab-chassis			E/C	09/10														
Ford5.4L	Ford	Bi-Fuel	F 250 2WD/4WD pick-up + cab-chassis							E	10										
Ford5.4L	Ford	Dedicated	F 250 2WD/4WD pick-up + cab-chassis			E/C	09			E	10					E	10				
Ford5.4L	Ford	B-Fuel	F 350 2WD/4WD pick-up + cab-chassis							E	10										
Ford5.4L	Ford	Dedicated	F 350 2WD/4WD pick-up + cab-chassis			E/C	09			E	10					E	10				
Ford5.4L	Ford	Dedicated	F 350 incomplete							E	10					E	10				
Ford5.4L	Ford	Bi-Fuel	E-150 Passenger/Cargo Van					E	09/10												

Continued on next page

Spark-Ignited Natural Gas (SING) Vehicles Up to 14,000#

(Contact SVM for Availabilities of Systems and Minimum Purchase Requirements for Previous Models Years)

(Engine/vehicle listings below refer to EPA and/or CARB certificate holders; some companies listed below may also install other SVM's systems)

Small Volume OEM (SVM) Vehicles (continued) (CONVERSIONS VIA SVMs AND/OR THEIR QUALIFIED SYSTEM RETROFITTERS)

Engine	Make		Model	Landi Renzo USA / Baytech		BAF Technologies		IMPCO Technologies		Altech-Eco		NGV Motori/ NGV Conversions		NatGas Car		GoNatural CNG		CNG Store dba Auto Gas Store		High Pressure Group	
				EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)	EPA/ CARB	Model Year(s)
Ford5.4L	Ford	Dedicated	E-150 Passenger/Cargo Van			E/C	09/10/11	E/C	11	E	10					E	10/11				
Ford5.4L	Ford	Bi-Fuel	E-250 Passenger/Cargo Van			E	11	E	10												
Ford5.4L	Ford	Dedicated	E-250 Passenger/Cargo Van			E/C	09/10/11	E/C	10/11	E	10	E	08			E	10/11				
Ford5.4L	Ford	Bi-Fuel	E-350 Passenger/Cargo Van/Club Wagon			E	11	E	10												
Ford5.4L	Ford	Dedicated	E-350 Passenger/Cargo Van/Club Wagon			E/C	09/10/11	E/C	10/11	E	10	E	08			E	10/11				
Ford5.4L	Ford	Dedicated	E-350 Cutaway					E	10	E	10					E	10/11				
Ford5.4L	Lincoln	Bi-Fuel	Navigator					E	09/10												
Ford5.4L	Lincoln	Dedicated	Navigator			E/C	09/10									E	10/11				
Ford6.2L	Ford	Bi-Fuel	F250 2WD/4WD pick-up truck			E	11														
Ford6.2L	Ford	Dedicated	F250 2WD/4WD pick-up truck			E/C	11	E	11												
Ford6.2L	Ford	Bi-Fuel	F350 2WD/4WD pick-up truck			E	11														
Ford6.2L	Ford	Dedicated	F350 2WD/4WD pick-up truck			E/C	11	E	11												
Ford6.8L	Ford	Dedicated	E-450 Cutaway (may exceed 14,000#)			E/C	09/10/11	E/C	11												
Ford6.8L	Ford	Dedicated	F-450 Super Duty truck			E/C	10/11	E/C	11												
Ford6.8L	Ford	Dedicated	F-550 Super Duty truck			E/C	10/11	E/C	11												
Ford6.8L	Ford	Dedicated	F-53/F-59 strip chassis			E/C	10/11														

Contacts

Company	Address	Name	Telephone	E-Mail
Altech-Eco	101 Fair Oaks Road, Arden, NC 28704	Mike Cerven	828-654-8300	mikecerven@altecheco.com
American Honda Motor Co.	1919 Torrance Blvd, MS 100-3C-3A, Torrance, CA 90501	Eric Rosenberg	310-781-4457	eric_rosenberg@ahm.honda.com
BAF Technologies	2415 Beatrice Street, Dallas, TX 75208	Brent Pope	214-231-1458	bpope@baftechnologies.com
CNG Store (dba Auto Gas Store)	1596 West 2650 S, Ste 103, Ogden UT 84401		866-931-8940	support@autogasamerica.com
Cummins Westport Inc.	1750 West 75th Ave., #101, Vancouver, BC V6P 6G2	Jeff Campbell	604-718-8100	jcampbell@cumminswestport.com
Doosan Infracore America	2905 Shawnee Industrial Way, Suwanee GA 30024	Kwangsup Hwang	770-831-3486	kwangsup.hwang@doosan.com
Emission Solutions Inc.	2001 Central Circle, Ste 106, McKinney TX 75069	Jim Moore	972-369-0092	jimmoore@emissionsolutionsinc.com
General Motors	100 Renaissance Center, MC: 482-A20-B11, Detroit, MI 48265	Andrew Reyntjes	313-665-4546	andrew.w.reyntjes@gm.com
GoNatural CNG	1565 South Redwood Road, Woods Cross, UT 84087	Rick Oliver	801-281-4766	roliver@gonaturalcng.com
High Pressure Group	1468 James Road, Gardnerville, NV 89460	Trent Colbert	775-455-4059	info@highpressuregroup.com
IMPCO Technologies	3030 South Susan Street, Santa Ana, CA 92704	Rob Lykins	765-964-6009	rlykins@impcotechnologies.com
Landi Renzo USA/Baytech	23535 Telo Avenue, Torrance, CA 90505	Jed Tallman	303-868-7404	jtallman@landiusa.com
NatGasCar	17000 St. Clair Avenue, Cleveland, OH 44110	John Webster	216-692-3700	jwebster@natgascar.com
NGV Conversions/NGV Motori	5985 Callcott Way, Ste. 1416 Alexandria VA 22312	Kenyon Larsen	703-750-0619	klarsen@ngvus.com
Westport Innovations	1750 West 75th Ave., #101, Vancouver, BC V6P 6G2	Jonathan Burke	604-718-8100	jburke@westport.com

SEE ALSO http://www.ngvamerica.org/pdfs/FAQs_Converting_to_NGVs.pdf for more information

PLEASE, DO NOT CONTACT HONDA FOR CONVERSION SYSTEMS - THEY OFFER AN OEM VEHICLE ONLY

PLEASE, DO NOT CONTACT NGVAMERICA TO ASK WHY A RETROFIT SYSTEM IS NOT AVAILABLE FOR YOUR MAKE/MODEL YEAR (WE DO NOT CONTROL/INFLUENCE OEM's/SVM's R&D AND EPA/CARB CERTIFICATION DECISIONS)

PLEASE, DO NOT CALL/E-MAIL NGVAMERICA QUESTIONING EPA/CARB CERTIFICATION REQUIREMENTS AND COSTS. WE DO NOT REPRESENT EPA NOR CARB. WE INFORM PROSPECTIVE PURCHASERS OF THE APPLICABLE LAWS AND REQUIREMENTS

BUYER BEWARE: SEVERAL ORGANIZATIONS PURPORTING TO BE EXPERTS ABOUT NGV CERTIFICATION REGULATIONS AND REQUIREMENTS ERRANTLY SUGGEST THAT EPA CERTIFICATIONS ARE NOT REQUIRED ON VEHICLE RETROFITS. EPA's OTAQ AND ENFORCEMENT DIVISIONS CONFIRM THAT COCs ARE REQUIRED.

For more information, please contact:

NGVAMERICA
Natural Gas Vehicles for America

400 North Capitol Street, N.W.
Washington, D.C. 20001
ngvamerica.org

Stephe Yborra
Director of Market Development

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301.829.2520 office
301.829.2520 fax

IMPCO Automotive Aftermarket Systems // 2010-11 Certificates

v.11811

BI*FUEL SYSTEMS

	Year	Model	Engine	Fuel	Kit Part #	OEM Engine Group	EPA cert	CARB cert	FORECAST 2011 TOTAL	1st Q	2nd Q	3rd Q	4th Q
GM	2009	Impala	3.9L	CNG	SQ-50846-02-0010	9GMXV03.9052	available	-					
	2009	Impala	3.9L	LPG	SQ-50846-02-0011	9GMXV03.9052	available	-					
	2010	Impala	3.5L	CNG	SQ-50846-02-0018	AGMXV03.9055	available	-					
	2010	Impala	3.5L	LPG	SQ-52316-01-001	AGMXV03.9055	available	-					
	2011	Impala	3.5L	CNG	*TBD*	BGMXV03.9055	June	-					
	2011	Impala	3.5L	LPG	*TBD*	BGMXV03.9055	July	-					
	2009	Silverado/Tahoe	5.3L	CNG	SQ-50846-02-0006	9GMXT05.3373	available	-					
	2009	Silverado/Tahoe	5.3L	LPG	SQ-50846-02-0008	9GMXT05.3373	available	-					
	2010	Silverado/Tahoe	5.3L	CNG	SQ-50846-02-0014	AGMXT05.3373	available	-					
	2010	Silverado/Tahoe	5.3L	LPG	SQ-52314-02-001	AGMXT05.3373	February	-					
	2011	Silverado/Tahoe	5.3L	CNG	SQ-52318-02-001	BGMXT05.3373	available	-					
	2011	Silverado/Tahoe	5.3L	LPG	SQ-52321-02-001	BGMXT05.3373	March	-					
	2008	HD2500	6.0L	CNG	SQ-50846-02-0003	8GMXK06.0396	available	-					
	2009	HD2500	6.0L	CNG	SQ-50846-02-0007	9GMXD06.0396	available	-					
	2009	HD2500	6.0L	LPG	SQ-50846-02-0009	9GMXD06.0396	available	-					
	2010	HD2500	6.0L	CNG	SQ-50846-02-0016	AGMXD06.0396	available	-					
	2010	HD2500	6.0L	LPG	SQ-52315-02-001	AGMXD06.0396	available	-					
	2011	HD2500	6.0L	CNG	SQ-52317-02-001	BGMXT06.0396	available	-					
	2011	HD2500	6.0L	LPG	SQ-52322-02-001	BGMXT06.0396	March	-					
FORD	2010	Transit Connect	2.0L	CNG	SQ-52319-01-001	AFMXT02.01DV	March	-					
	2010	Transit Connect	2.0L	LPG	*TBD*	AFMXT02.01DV	*TBD*	-					
	2011	Transit Connect	2.0L	CNG	*TBD*	BFMXT02.01DV	*TBD*	-					
	2011	Transit Connect	2.0L	LPG	*TBD*	BFMXT02.01DV	*TBD*	-					
	2009	Crown Vic	4.6L	CNG	SQ-52312-01-001	9FMXV04.6VDF	February	-					
	2009	Crown Vic	4.6L	LPG	SQ-50846-01-0006	9FMXV04.6VDF	available	-					
	2010	Crown Vic	4.6L	CNG	SQ-52308-01-001	AFMXV04.6VDF	March	-					
	2010	Crown Vic	4.6L	LPG	SQ-52309-01-001	AFMXV04.6VDF	Available	-					
	2011	Crown Vic	4.6L	CNG	*TBD*	BFMXV04.6VHF	July	-					
	2011	Crown Vic	4.6L	LPG	*TBD*	BFMXV04.6VHF	June	-					
	2009	F150	5.4L	CNG	SQ-50846-01-0004	9FMXT05.44ET	available	-					
	2009	F150	5.4L	LPG	SQ-50846-01-0003	9FMXT05.44ET	available	-					
	2010	F150 (FED)	5.4L	CNG	SQ-50846-01-0005	AFMXT05.44ET	available	-					
	2010	F150 (FED)	5.4L	LPG	SQ-50846-01-0007	AFMXT05.44ET	available	-					
	2010	F150 (50 States)	5.4L	CNG	SQ-52320-01-001	AFMXT05.44BC	February	-					
	2010	F150 (50 States)	5.4L	LPG	*TBD*	AFMXT05.44BC	*TBD*	-					
	2011	F150	5.0L	CNG	*TBD*	BFMXT05.03DD	April	-					
	2011	F150	5.0L	LPG	*TBD*	BFMXT05.03DD	May	-					
	2010	E150/250/350	5.4L	CNG	SQ-52310-01-001	AFMXT05.45H4	available	-					
	2010	E150/250/350	5.4L	LPG	SQ-52311-01-001	AFMXT05.45H4	*TBD*	-					
	2010	E150/250/350 (Late MY)	5.4L	CNG	SQ-52323-01-001	AFMXT05.45HJ	February	-					
	2010	E150/250/350 (Late MY)	5.4L	LPG	*TBD*	AFMXT05.45HJ	*TBD*	-					
	2011	E150/250/350	5.4L	CNG	SQ-52324-01-001	BFMXT05.45HK	March	-					
	2011	E150/250/350	5.4L	LPG	*TBD*	BFMXT05.45HK	May	-					
	2011	Expedition	5.4L	CNG	SQ-52325-01-001	BFMXT05.44HY	March	-					
	2011	Expedition	5.4L	LPG	*TBD*	BFMXT05.44HY	*TBD*	-					
	2011	F250	6.2L	CNG	SQ-52313-01-001	BFMXT06.27HL	May	-					
	2011	F250	6.2L	LPG	SQ-52326-01-001	BFMXT06.27HL	June	-					

MONO*FUEL SYSTEMS

	Year	Model	Engine	Alt Fuel	Kit Part #	OEM Engine Group	EPA cert	CARB cert	FORECAST 2011 TOTAL	1st Q	2nd Q	3rd Q	4th Q
GM	2010	GM 4.8 LD	4.8L	CNG	EVT-52675-02-A01	-	available	*TBD*					
	2010	GM 4.8 HD	4.8L	CNG	EVT-52675-02-A02	-	available	*TBD*					
	2011	GM 4.8 HD	4.8L	CNG	EVT-52675-02-B02	-	available	*TBD*					
	2010	GM 5.3	5.3L	CNG	EVT-52676-02-A01	AGMXT05.3373 AGMXT05.3377 AGMXT05.3381 AGMXT05.3389	available	*TBD*					
	2010	GM 6.0 8.5-10GVW	6.0L	CNG	EVT-52677-02-A01	AGMXD06.0396	available	*TBD*					
	2010	GM 6.0 10-14 GVW	6.0L	CNG	EVT-52677-02-A02	AGMXD06.0396	available	*TBD*					
	2011	GM 6.0 10-14 GVW	6.0L	CNG	EVT-52677-02-B02	AGMXD06.0396	available	*TBD*					
	2011	GM 6.0 >14 GVW	6.0L	CNG	*TBD*	AGMXD06.0396	available	*TBD*					
FORD	2010	Transit Connect	2.0L	CNG	EVT-52663-01-A02	AFMXT02.01DV	available	*TBD*					
	2011	Transit Connect	2.0L	CNG	*TBD*	BFMXT02.01DV	March	*TBD*					
	2010	Focus	2.0L	CNG	EVT-52664-01-A01	AFMXV02.0VEC	available	*TBD*					
	2011	Focus	2.0L	CNG	*TBD*	BFMXV02.0VEC	March	*TBD*					
	2010	E150/250/350	5.4L	CNG	EVT-52660-01-A02	AFMXT05.45H4	available	*TBD*					
	2011	E150/250/350	5.4L	CNG	EVT-52660-01-B01	BFMXT05.45HK	March	*TBD*					
	2010	E450	6.8L	CNG	EVT-52661-01-A02	-	available	*TBD*					
	2011	E450	6.8L	CNG	EVT-52661-01-B02	-	available	*TBD*					
	2011	F450/550	6.8L	CNG	EVT-52662-01-B02	-	available	*TBD*					

Fleet Operators Business Name	ABC Fleet
Contact Person's Name	Pat Jones
Telephone number	316-123-4567
email address	

Mailing Address (street numbers)	890 East Lane
City State Zip Code	Dubuque, IA 52001-4805
Address of Fleet Location	
Date	15-Jul-10

Fleet Operator Information Sheet: The information provided below from a fleet operator will assist in determining the type and size fueling station needed to fuel Operator's natural gas fleet.

	Cars			Pick-ups/Vans		Buses/Shuttles / Transit			School		Street Sweepers	Trucks Refuse		Other Vehicles		
	Compact	Medium	Luxury	1/2 Ton	3/4 Ton	Light Duty	Medium Duty	Heavy Duty	Medium Duty	Heavy Duty	Medium Duty	Medium Duty	Heavy Duty	Medium Duty	Heavy Duty	Totals
Number of Vehicles	0	0	0	0	2	14	10	0	0	0	0	0	0	0	0	25
Number of Miles/Day/Vehicle	0	0	0	0	70	70	100	0	0	0	0	0	0	0	0	240
Number of Miles Driven/Year/Vehicle	0	0	0	0	12000	22271	35749	0	0	0	0	0	0	0	0	70020
Number of Diesel Fueled Vehicles	0	0	0	0	0	4	7	0	0	0	0	0	0	0	0	11
Number of Gal(s) Diesel/Year	0	0	0	0	0	5568	26041	0	0	0	0	0	0	0	0	31609
Number of Gasoline Fueled Vehicles	0	0	0	0	2	10	3	0	0	0	0	0	0	0-	0	15
Number of Gal(s) Gasoline/Year	0	0	0	0	1091	13919	11289	0	0	0	0	0	0	0	0	26299
Annual Maintenance Costs	$0	$0	$0	$0	$250	$600	$600	$0	$0	$0	$0	$0	$0	$0	$0	$1,450
Number of Gallons of Fuel Per Day/Vehicle	0.00	0.00	0.00	0.00	3.18	4.50	10.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.21
Number of Gallons of Fuel Per Year/Vehicle	0.00	0.00	0.00	0.00	545	1392	3763	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5700
Tax Exempt Entity (yes or no)					Yes	Yes	Yes									N/A
Vehicle Replacement Cost/Vehicle	$0	$0	$0	$0	$35,000	$78,000	$165,000	$0	$0	$0	$0	$0	$0	$0	$0	$278,000
Number of Hours each Vehicle is Parked at base.	0	0	0	0	0	8	8	0	0	0	0	0	0	0	0	N/A
Is Vehicle Parked w/ Fleet (yes or no)					No	Yes	Yes									N/A
Number of Replacement Vehicles/Year 1	0	0	0	0	2	7	3	0	0	0	0	0	0	0	0	12
Year 2	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	6
Year 3	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	6
Year 4	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2
Year 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MPG Per Vehicle (if known)	1	1	1	1	22	16	9.5	1	1	1	1	1	1	1	1	N/A
Medium Duty	10,000 - 33,000 GVWR															
Heavy Duty	> 33,000 GVWR															
Miles Per Gallon Est.	25	19	15	18	13	8	6	4	6	4	6	6	4	6	4	

What Hours Are These Vehicles Fueled? ie. 6:00 pm to 6:00 am	11:00 pm to 6:00 am
Is A Back-up Fueling Facility Available Nearby for Emergencies? Yes or No	No
Is A Redundant Fueling Station Required? Yes or No	Yes
Is the Fleet Located in an Urban or Suburban Area? Yes or No	Unknown
Approximate Size of Property for Fueling Station in sq. ft.	Unknown

Do Local Codes Regulations Allow for a NGV Fueling Station? (Yes or No)	Yes
What is the Maximum Natural Gas Delivery Pressure Available?	20 #
Electrical Service - Is 480 v / 3 Phase available? Yes or No	Unknown
How many time-fill dispensers are needed?	12 double hose

How many quick fill dispensers are needed?	1 double hose
How many vehicles need to fueled at one time?	4
Can any vehicles be staggered throughout the day? Yes or No	Maybe

Number of gallons for time fill fleet	15.03
Number of hours to fi fleet from time fill	8
Number of vehicles using time fill	24
Total number of gallon to fill all vehicles	361
Number of gallons per hour	45

No. scfm/gge	125
No. scf/hour	5500
No. scfm	108

EXHIBIT
tabbies
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CMHC TRANSITION PROJECT

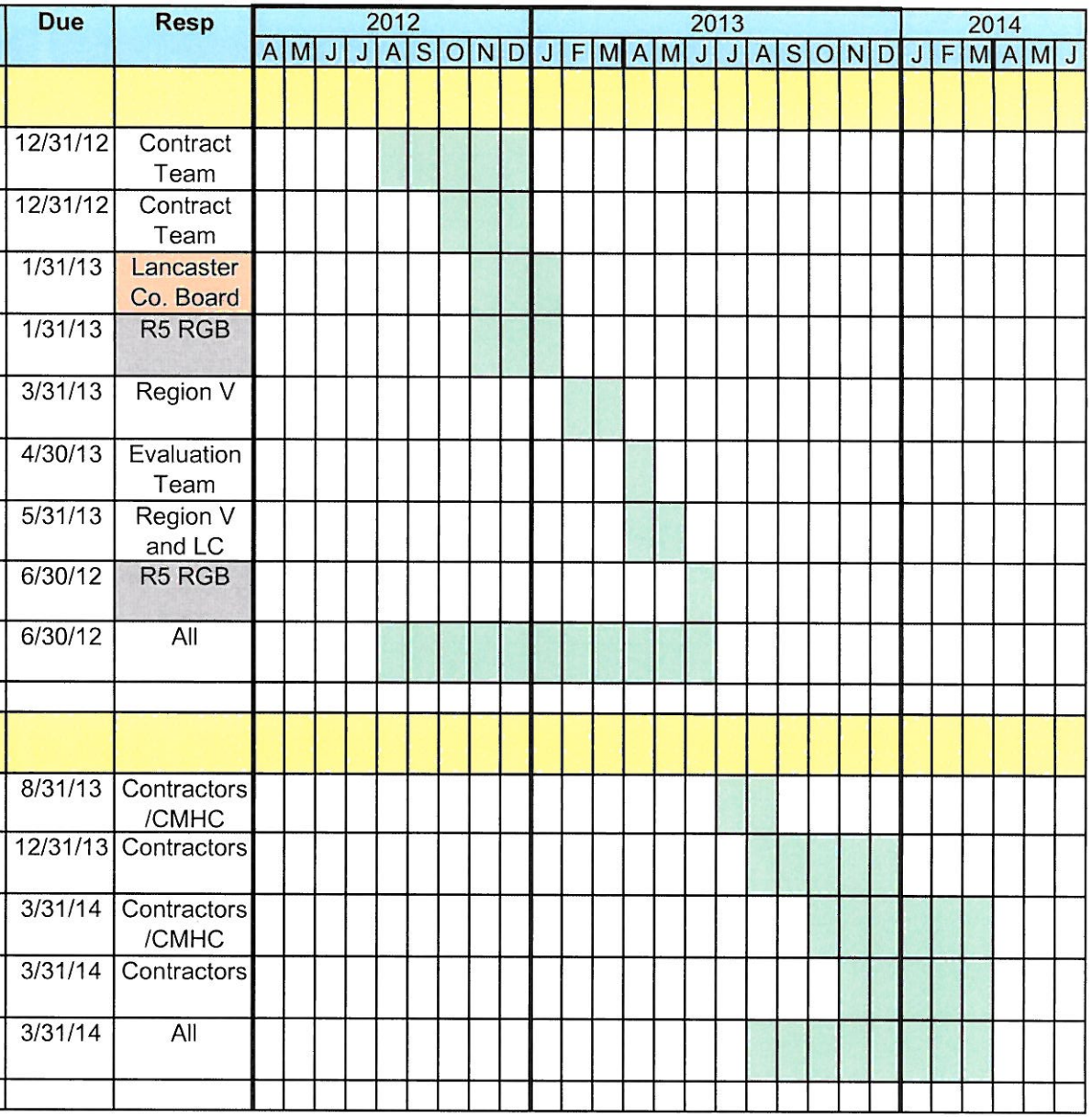
WORKPLAN

PROJECT OBJECTIVE	Start	Due	Resp	2012									2013											2014					
				A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
1. Organize CMHC Transition Project																													
1. Establish Memorandum of Understanding between Lancaster County and Region V	4/12/12	5/31/12	LCB RVS																										
2. Establish Project Advisory Panel	4/12/12	5/31/12	Lancaster Co. Board																										
3. Develop and Implement Detailed Work Plan (WBS)	4/12/12	5/31/12	Ron S.																										
4. Communicate Project Status with consumers, CMHC employees, providers, and stakeholders	4/12/12	5/31/12	All																										
2. Design new service development system																													
1. Determine funding to be provided for behavioral health services by Lancaster Co.	5/1/12	6/30/12	Lancaster Co. Board																										
2. Define organizational structure and funding of Crisis Center	5/1/12	6/30/12	Lancaster Co. Board																										
3. Review CMHC and behavioral health system programs and services	5/1/12	6/30/12	Advisory Panel																										
4. Identify consumer service needs/expectations	5/1/12	7/31/12	Advisory Panel																										
5. Identify best/evidence based practices	6/1/12	7/31/12	Advisory Panel																										
6. Identify reimbursement issues/opportunities	6/1/12	7/31/12	Advisory Panel																										
7. Develop project performance measures	7/1/12	7/31/12	Advisory Panel																										
8. Recommend program and services to be delivered	7/1/12	8/31/12	Advisory Panel																										
9. Review recommendations and determine programs and services to be delivered	9/1/12	9/30/12	Lancaster Co. Board R5 RGB																										
10. Approval of service plan by Lancaster County Board	9/1/12	9/30/12	Lancaster Co. Board																										
11. Approval of service plan by Region V Governing Board	11/1/12	9/30/12	R5 RGB																										
12. Communicate Project Status with consumers, CMHC employees, providers, and stakeholders	11/1/12	9/30/12	All																										

CMHC TRANSITION PROJECT

WORKPLAN

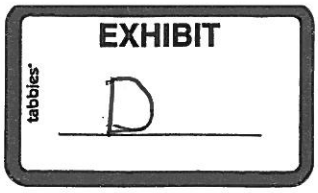
PROJECT OBJECTIVE	Start	Due	Resp
3. Choose Contractor(s) for New Services			
1. Develop contract specifications	8/1/12	12/31/12	Contract Team
2. Develop application process and evaluation method	11/1/12	12/31/12	Contract Team
3. Approval of application process/evaluation method by Lancaster County Board	12/1/12	1/31/13	Lancaster Co. Board
4. Approval of application process/evaluation method by Region V Systems RGB	12/1/12	1/31/13	R5 RGB
5. Announce application process and deadlines	2/1/13	3/31/13	Region V
6. Accept and evaluate contractor proposals	4/1/13	4/30/13	Evaluation Team
7. Negotiate/agree to contracts with new service provider(s)	5/1/13	5/31/13	Region V and LC
8. Approval of Contracts by Region V Systems Governing Board	6/1/13	6/30/12	R5 RGB
9. Communicate Project Status with consumers, CMHC employees, providers, and stakeholders	8/1/12	6/30/12	All
4. Implement Contracts for New Services			
1. Interview current CMHC employees for employment with new contractors	7/1/13	8/31/13	Contractors /CMHC
2. Transition or hire staff/train staff	8/1/13	12/31/13	Contractors
3. Transition caseloads to new providers	10/1/13	3/31/14	Contractors /CMHC
4. Open services and facilities	11/1/14	3/31/14	Contractors
5. Communicate Project Status with consumers, CMHC employees, providers, and stakeholders	8/1/13	3/31/14	All



CMHC TRANSITION PROJECT

WORKPLAN

PROJECT OBJECTIVE	Start	Due	Resp	2012									2013											2014					
				A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
5. Project Evaluation and Closeout																													
1. Manage and Evaluate the Project/Report Project Status	4/12/12	3/31/14	Executive Team																										
2. Project close-out report	2/1/14	4/30/14	Executive Team																										
3. Communicate Project Status with consumers, CMHC employees, providers, and stakeholders	2/1/14	4/30/14	All																										



BASELINE IMPACT MEASURES, POST CMHC FRACTURE - OR HOW EFFECTIVE WAS AN INTEGRATED COMPREHENSIVE BEHAVIORAL HEALTH SYSTEM?

Sample time line - last quarter of 2011.

BryanLGH West Mental Health Emergency Department contacts 982

Lincoln Police Department Mental Health Investigations 493, Suicide Attempts 78, EPCs 76

Jail Admissions for those with a Mental Health History (Flags) 726

Number of Crisis Center Admissions 156

Number of Calls to CMHC's Hotline and crisis walk ins 813

Number of Mental Health Related Calls to the Mayor's Ombudsman 41

Number of Mental Health Related Incidents in Lincoln's Public Libraries 65

Lincoln's Homeless County 964

CMHC/Region V Contracted Units FY 2011/2012 Med Management 4,125 - Day Rehab 1,607 - Res Rehab Medicaid 598 - Community Support 2,100 - Day Treatment 592 - Outpatient $251,935 (both Indiv & Group) - Post Commitment NA

Rehospitalization rate for CMHC's Community Support only _____

April 25, 2012