

*the Energy to Lead*

# CNG and Propane Vehicle Conversion Guidelines

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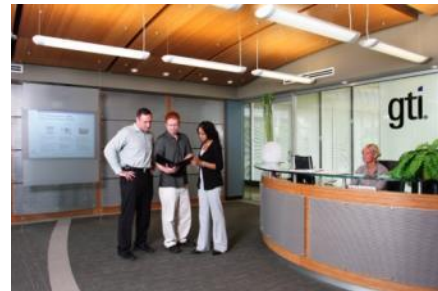
Green Drive\$  
May 2015

Ted Barnes  
Gas Technology Institute

# Gas Technology Institute (GTI) Overview

## Natural Gas Research and Development Focus

- > Established in 1941
- > Staff of ~300
- > 350 active projects
- > 1,200 patents; 500 products



Training



Office & Labs



Pilot-Scale Gasification Campus



Energy & Environmental Technology Center

# Gas Technology Institute (GTI)

## Barrier Reduction Grant – US Dept. of Energy

**GTI and Lake Michigan Consortium created webinars on important alternative fuel topics:**

- Inspection Guidelines for CNG/LPG Vehicle Conversions
- Considerations for Garage & Maintenance Shops When Using CNG/LPG
- Station Installation Guidelines for CNG
- Station Installation Guidelines for LPG
- Best Practices for End Users for CNG, LPG & Electric Vehicles



**Presentations are available on Clean Cities websites**

# Compressed Natural Gas (CNG) Vehicle Purchases

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- > Natural Gas Vehicles (NGVs) are purchased from:
  - OEMs at the dealership
  - Small or Qualified Vehicle Manufacturers (SVMs/QVMs)
  - Local conversion companies
- > NGVs are available for all needs:
  - Light duty (sedan, pickup, van)
  - Medium duty (school bus, box truck, work truck)
  - Heavy duty (regional/long haul, waste hauler, cement mixer)

# Light Duty CNG Vehicles Available from OEMs



**Honda  
Natural Gas  
Civic Sedan  
(dedicated)**

**NGVAMERICA**

Natural Gas Vehicles for America



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

**GM Express/Savana  
Cargo & Passenger  
Vans (dedicated)**



**Bi-fuel GM Impala  
(bi-fuel)**



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





# Light and Medium Duty NGVs Available Through SVMs and Conversions



**NGVAMERICA**  
Natural Gas Vehicles for America

# Heavy Duty Trucks with OEM Engine



**NGVAMERICA**  
Natural Gas Vehicles for America



# Selection of NGVs from OEMs, SVMs, Local Converters

## Light Duty OEMs

- > Honda
- > General Motors
- > Chrysler Ram Trucks
- > Ford\*

## Local Converters

- > Advanced VTech
- > Autotruck
- > Dual Fuel Systems
- > World CNG
- > Others?

## Light Duty/Medium Duty Retrofits

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

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

**NGVAMERICA**

Natural Gas Vehicles for America



# Selection of NGVs from OEMs, SVMs

## HD Truck OEMs

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

## HD Vocational OEMs

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

## HD Bus OEMs

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

## HD Retrofit/Repowers

- > American Power Group
  - > Clean Air Power
  - > Fyda Energy Solutions
  - > NGV Motori
  - > Omnitek Engineering
  - > Diesel 2 Gas
- Dual fuel retrofits and SING repowers of Cummins, Daimler, Navistar, Detroit Diesel, Mack, Volvo, Caterpillar

# Conversion of CNG Vehicles

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Guidance: Select approved kits and converters:

1. US EPA and CARB certified conversion kits and engine platforms are allowable under current federal regulation.
  - **NGV America List:**  
<https://www.ngvamerica.org/vehicles/vehicle-availability/>
  - **EPA Website:**  
<http://www.epa.gov/otaq/consumer/fuels/altfuels/documents/certified-conversions.xls>
2. Converters need to be approved by kit manufacturer. It is preferred to confirm converter has ASE/CSA qualified technicians installing conversion kits.

# Conversion of CNG Vehicles

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3. Expand knowledge base. Use the following resources to educate yourself in the basics.
  - “Have Your Vehicle Converted to Compressed Natural Gas- Safety”, Clean Vehicle Education Foundation  
[http://www.cleanvehicle.org/committee/technical/PDFs/Convert\\_Your\\_Vehicle\\_Safely\\_Final.pdf](http://www.cleanvehicle.org/committee/technical/PDFs/Convert_Your_Vehicle_Safely_Final.pdf)
  - US DOE Alt Fuel Data Center – Vehicle Conversion Regulations and Info  
<http://www.afdc.energy.gov/vehicles/conversions.html>

# Inspection of CNG Vehicles

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## > What are the rules?

Tanks/Fuel systems must be inspected every 3 years, 36,000 miles, after an accident or fire, and before it is reinstalled on a vehicle

## > Who can inspect?

The CGA defines a qualified inspector as any of the below:

- 2 years experience conducting inspections
- Supervision by person with 2 years experience conducting inspections
- Approved by fuel cylinder manufacturer
- Certification from OEM through training center
- **Certification from nationally recognized organization e.g. CSA**
- Certification as inspector by Authority Having Jurisdiction



# Inspection of CNG Vehicles

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## > How do you find a certified inspector?

- CSA provides certification for CNG fuel system inspection which includes all major components and tanks.
- CSA offers a list of qualified and certified fuel system inspectors on their website:

<http://www.csagroup.org/us/en/services/education-and-training/personnel-certification/people-search>

## > How do you become an inspector?

- Take a course / pass the CSA test
- US DOE Alt Fuel Data Center has info:

[http://www.afdc.energy.gov/vehicles/technician\\_training.html](http://www.afdc.energy.gov/vehicles/technician_training.html)

# Propane / LPG / Autogas Vehicle Purchases

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- > Propane vehicles are purchased from:
  - OEMs at the dealership
  - Small or Qualified Vehicle Manufacturers (SVMs/QVMs)
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- > Propane vehicles are available for:
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  - Medium duty (school bus, box truck, work truck)

# Propane / LPG / Autogas Vehicle Purchases

> Several options for OEM/conversions:

- Ford\*
- GM
- American Alternative Fuel
- Blossman Services
- CleanFuel USA
- Greenkraft Inc.
- ICOM
- IMPCO
- Landi Renzo
- Roush



*Photo from Blue Bird Corp.*



*Photo from Ford Motor Co.*



Ford Super Duty F-450 available with LPG prep package.  
*Photo from Ford Motor Company*

# LPG Vehicle Conversion

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Conversion guidance:

1. US EPA and CARB certified conversion kits and engine platforms are allowable under current federal regulation.
  - **EPA Website:** Certified Clean Alternative Fuel Conversion Systems  
<http://www.epa.gov/otaq/consumer/fuels/altfuels/documents/certified-conversions.xls>
  - **PERC List:**  
[http://www.propane.com/uploadedFiles/Propane/On\\_Road\\_Fleets/Propane\\_Conversions/January2015OTRManufacturerListingPublicView.pdf](http://www.propane.com/uploadedFiles/Propane/On_Road_Fleets/Propane_Conversions/January2015OTRManufacturerListingPublicView.pdf)



# LPG Vehicle Purchase (Continued)

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2. Confirm converter has trained technicians installing conversion kits. (NFPA 58)
  - Propane autogas technician course and training (PERC partnership with NAFTC)
  - OEM approved/trained installations
3. Expand knowledge base using existing resources: Propane Education and Research Council (PERC) and Alt Fuel Data Center websites are useful:
  - [www.autogasusa.org](http://www.autogasusa.org)
  - [http://www.afdc.energy.gov/vehicles/propane\\_conversions.html](http://www.afdc.energy.gov/vehicles/propane_conversions.html)

# LPG Vehicle Inspection

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Inspection guidance: Know the facts.

1. Propane containers are certified by ASME or DOT
  - DOT cylinders are mainly used for industrial and off road applications such as forklifts, mowers, etc.
2. NFPA 58 states fuel containers have to be requalified per Compressed Gas Association inspection criteria. Good practice to include vehicles involved in fire and/or auto accidents.
3. Follow OEM specifications for inspections/training.
4. NFPA 58 requires vehicle fuel system to be leak free prior to garage storage or service.

# Questions?

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Thank you for your time.