

# Integrating Medium and Heavy Duty Natural Gas Vehicles into Your Fleet

Tuesday, July 24, 2018



- **Webinar is being offered through DOE's Vehicle Technologies Office (VTO) Technology Integration Program and the Better Communities Alliance**
  - <https://www.energy.gov/eere/vehicles/technology-integration>
  - <https://betterbuildingsinitiative.energy.gov/bca>
- **Webinar will be archived within two weeks**
  - <https://cleancities.energy.gov/webinars#24671>
  - <https://betterbuildingsinitiative.energy.gov/bca>

**Please type your questions into the question pane on the control panel**

# Presenters

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- **John Gonzales, Senior Engineer, National Renewable Energy Laboratory**
- **Tracy Ochsner, Assistant Operation Services Director, City of Fort Collins, CO**

# Integrating Medium- and Heavy-Duty Natural Gas Vehicles into Your Fleet

John Gonzales  
July 24, 2018

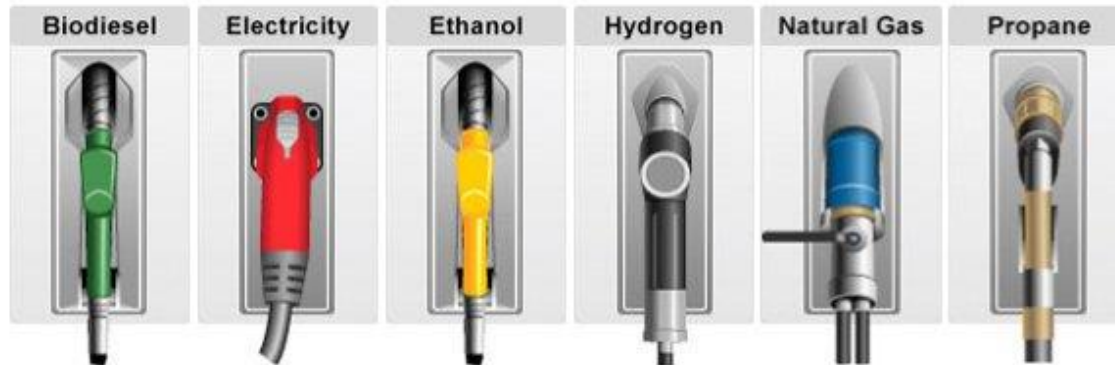


# Technology Integration Program Focus Areas

## Light-, Medium-, and Heavy-duty Vehicles



## Alternative Fuel Infrastructure



## Energy Efficient Mobility Systems and Technologies

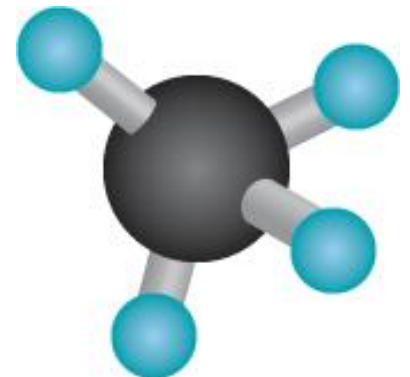
# National Network of Clean Cities Coalitions

*Nearly 100 Clean Cities coalitions with thousands of stakeholders, representing ~80% of U.S. population*



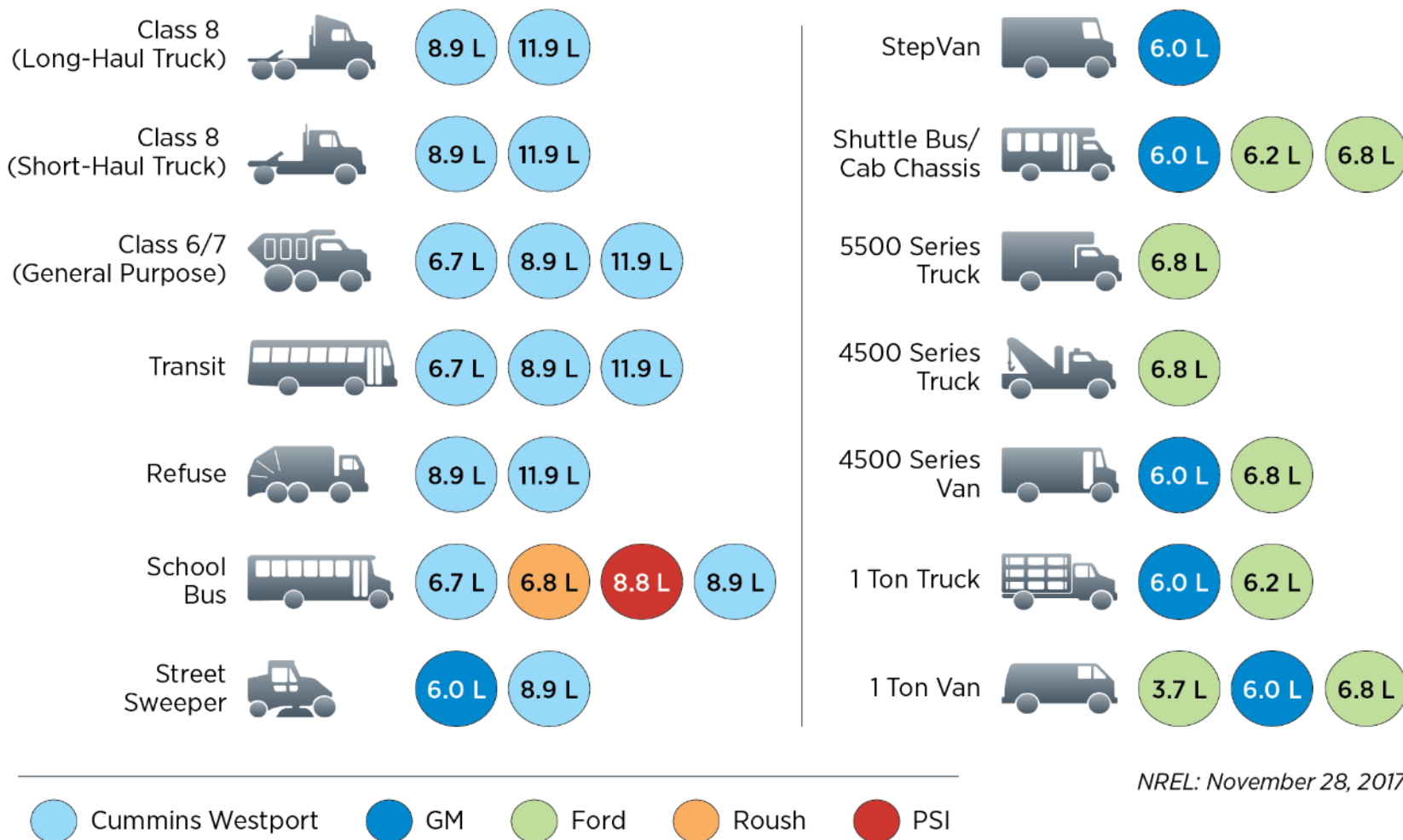
# Natural Gas Properties

- Mixture of hydrocarbons, predominantly methane ( $\text{CH}_4$ )
- High octane rating
- Nontoxic, noncorrosive, and noncarcinogenic
- Not a threat to soil, surface water, or groundwater
- Available as compressed natural gas (CNG) and liquefied natural gas (LNG)
- Lower ozone-forming emissions than gasoline
- Extracted from gas and oil wells
- High ignition temperature: 1,000–1,100 °F
- **Comprehensive fuel tank, vehicle, and station design/manufacturing codes & standards.**





# Available Medium and Heavy-Duty Vehicles



NREL: November 28, 2017

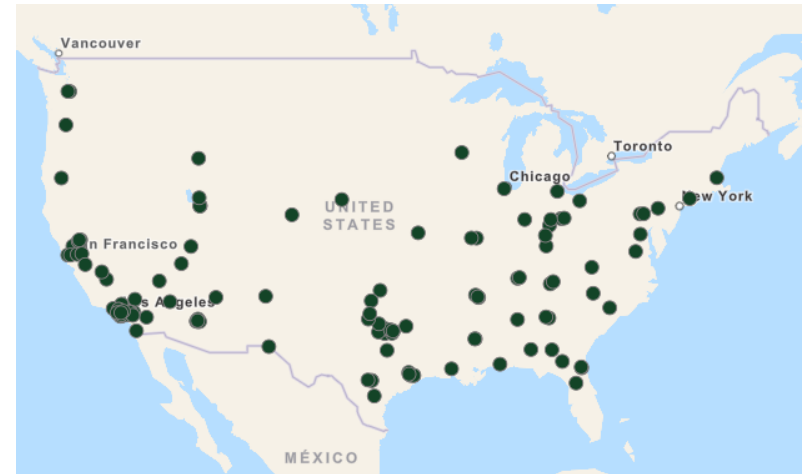
# Renewable Natural Gas (RNG)

<b>Production</b>	<ul style="list-style-type: none"><li>• Produced from biomass through a biochemical or thermochemical process</li><li>• Biomass sources include landfills, livestock operations, and wastewater treatment plants</li></ul>
<b>Applications</b>	<ul style="list-style-type: none"><li>• Interchangeable with conventional natural gas</li></ul>
<b>Benefits</b>	<ul style="list-style-type: none"><li>• Advanced biofuel under the Renewable Fuel Standard</li><li>• Generates credits through California's Low Carbon Fuel Standard program</li></ul>
<b>Considerations</b>	<ul style="list-style-type: none"><li>• Production costs</li><li>• Lower energy content than gasoline and diesel</li></ul>



# Liquified Natural Gas (LNG)

<b>Production</b>	<ul style="list-style-type: none"><li>• Purifying and supercooling natural gas to liquid form</li></ul>
<b>Applications</b>	<ul style="list-style-type: none"><li>• Long-haul trucking</li></ul>
<b>Benefits</b>	<ul style="list-style-type: none"><li>• High energy content</li></ul>
<b>Considerations</b>	<ul style="list-style-type: none"><li>• High production cost</li><li>• High storage cost</li></ul>



# Infrastructure: Types

## Existing, Offsite, Public Access

- Operated by retailer, utility, or other fleet
- May be an anchor fleet or part of a pool of fleets.

## New, Onsite, Private Access

- Exclusive use by your fleet
- Fast-fill and/or time-fill.

## New, Onsite, Public Access

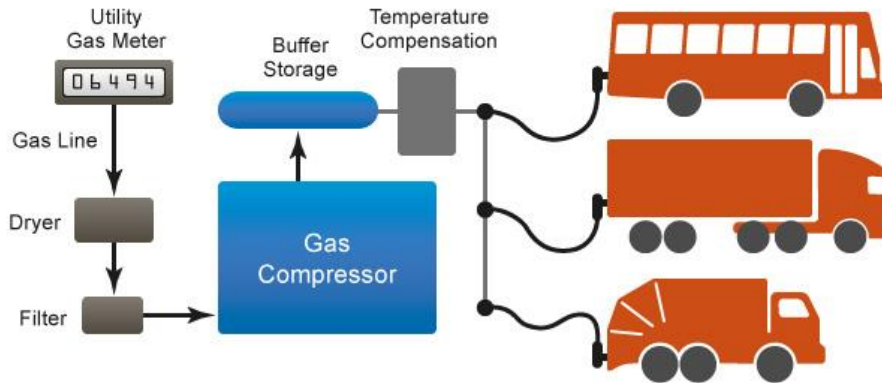
- Built outside of restricted areas
- Benefit from economy of scale
- Promotes public use of natural gas vehicles
- Must have fast-fill capabilities for public.

### Helpful Resource:

***VICE 2.0:*** Vehicles and Infrastructure Cash-Flow Evaluation Model allows fleet managers to assess the financial soundness of converting their vehicles to run on CNG, including the cost of building a new station.

# Infrastructure: CNG Fueling

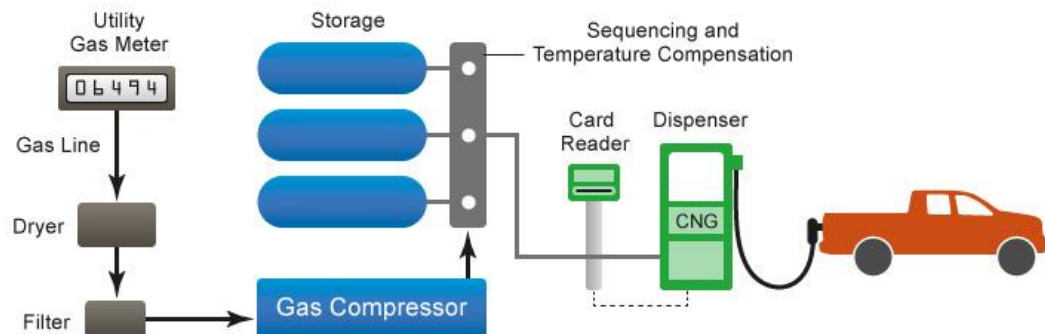
## Time-Fill Station



- Good for centrally-based fleets with consistent schedules
- CNG is dispensed slowly, often overnight
- Lower cost investment

- Fueling takes place in minutes
- Necessary for public-access stations
- Good for vehicles with little downtime

## Fast-Fill Station



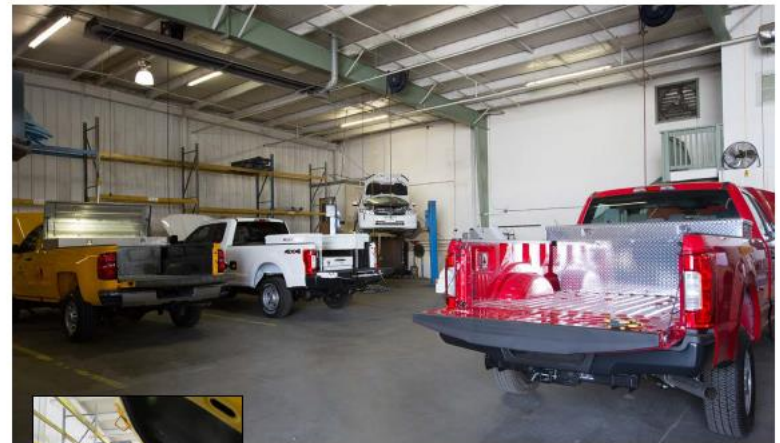


# CNG Maintenance Facility Modification Handbook

- Involved extensive collaboration with fleets and industry
- Answers recurring requests received by Technical Assistance for help locating, deciphering, and complying with CNG facility codes



## Compressed Natural Gas Vehicle Maintenance Facility Modification Handbook



September 2017

# CNG Facility Modification Handbook

Reviews all aspects of indoor CNG vehicle maintenance facility protection:

- Initial facility assessment
- Code compliance and requirements
- Specific design criteria.





A woman with long dark hair, wearing a white short-sleeved shirt, and a man with a beard, wearing a dark blue polo shirt, are leaning over the open hood of a yellow car. They are in a warehouse or garage setting, with tall yellow metal shelving units in the background. The shelves are filled with cardboard boxes. The man is pointing at something in the engine compartment. The woman is looking on. The car's engine and various components are visible. The text "Best Practices for Working with Local Codes Officials" is overlaid in white on a dark semi-transparent background.

# Best Practices for Working with Local Codes Officials

# Understanding Building Code Roles and Responsibilities

## Codes & Standards Agencies

### Develop Codes

- International Building Code
- International Electric Code
- International Mechanical Code
- NFPA 52 – Vehicular Gaseous Fuel Systems Code
- NFPA 88A – Standard for Parking Structures
- National Electric Code
- National Fire Code
- National Mechanical Code

## Local Governing Bodies

Decide which codes (and versions of codes) are applicable in their jurisdiction

## AHJs

Ensure the applicable codes are met

# Best Practices for Working with AHJs

- Establish an open dialog
- Engage early and often
  - Prevents costly and time-consuming re-work
  - Helps smooth the permitting process and avoids delays
  - Allows for immediate purchase of long-lead equipment items.



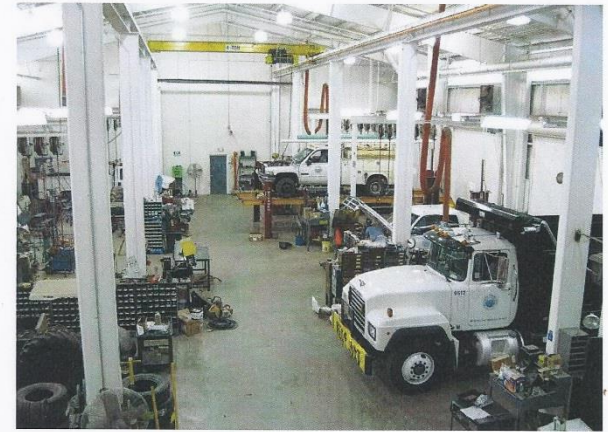


# Alternative Fuel Vehicle Conversion, Retrofits, and Repowers Handbook

- Involved extensive collaboration with fleets and industry
- Answers recurring requests received by Technical Assistance for help understanding the options available.



## What Fleets Need to Know About Alternative Fuel Vehicle Conversions, Retrofits, and Repowers



# Conversions, Retrofits, and Repowers Handbook Background

## What is an OEM

- Original Equipment Manufacturer
- Usually describes a major vehicle manufacturer
- Not to be confused with a system/kit manufacturer.



# Conversions, Retrofits, and Repowers Handbook Background

What is a conversion

- A process that modifies an existing engine:
  - To an alternative fuel like natural gas, propane, E85 or hybrid power
  - Can be Dedicated, Bi-fuel, Dual-fuel, Hybrid (plug-in or hydraulic assist)
  - NFPA 52, 58, and CSA as guiding documents.



# Additional Training Resources

- Alternative Fuel Vehicle Workplace Safety Programs (2016 DOE Funding Opportunity)
  - **Gas Technology Institute (GTI)** will create training and guidance materials for garage facility upgrades and building modifications for facilities that service natural gas, propane, and hydrogen vehicles.
  - **Marathon Technical Services USA, Inc.** will develop a unified reference guide of design requirements, and provide in-person training and tours that showcase best practices for garage/maintenance facilities that service natural gas, propane, and hydrogen vehicles.



# Technical Assistance

## Technical and Problem Solving Assistance

We capture lessons learned and best practices to:

- Address permitting & safety issues
- Identify chronic vehicle or infrastructure field problems
- Help with incident investigations.



## Tiger Teams

- Work with Clean Cities coalitions and stakeholders
- Tackle challenges for alternative fuel vehicle projects
- **Contact John Gonzales at [john.gonzales@nrel.gov](mailto:john.gonzales@nrel.gov)**



## Technical Response Service

- Research and respond to general and technical inquiries
- Educate policymakers and government officials
- Provide expert, reliable, vetted resources
- **Email [technicalresponse@icf.com](mailto:technicalresponse@icf.com) or call 800-254-6735 with technical questions**
- 48-hour standard response (indicate if you need it sooner).



# Considerations and Lessons Learned

## Technical Assistance

- Industry working groups continually make improvements
- Clean Cities Technical Assistance Project (Tiger Teams)



# Considerations and Lessons Learned

## Technical Assistance

- Direct consultation with manufacturers
- Clean Cities Technical Assistance Project (Tiger Teams)





# Information & Tools: Alternative Fuels Data Center

**Alternative Fuels Data Center**

Search the AFDC  **SEARCH**

**FUELS & VEHICLES** **CONSERVE FUEL** **LOCATE STATIONS** **LAWS & INCENTIVES** **Maps & Data** **Case Studies** **Publications** **Tools** **About** **Home**

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**Fuels & Vehicles**

Biodiesel Electricity Ethanol Hydrogen Natural Gas Propane


**Find Fleet Information by Application**

Get detailed vehicle data, case studies, and resources.



**The Information Source for Alternative Fuels and Advanced Vehicles**



The Alternative Fuels Data Center (AFDC) provides information, data, and tools to help fleets and other transportation decision makers find ways to reach their energy and economic goals through the use of alternative and renewable fuels, advanced vehicles, and other fuel-saving measures.

**Information by State**

 select a state ▼

**Information by Fleet Application**


 Delivery Services  Refuse Collection

 Public Transit  School Transportation

**Maps & Data**

- U.S. Alternative Fueling Stations by Fuel Type
- Alternative Fuel Vehicles in Use
- U.S. Hybrid Electric Vehicle Sales by Model


**Fuel Prices**



**Tools**

- LAWS & Incentives
- Electricity Sources & Emissions
- Vehicle Cost Calculator
- Vehicle Search

**Station Locator**



Download [iPhone app](#) or [Android app](#)

- ✓ Specific information on fuels, vehicles, technologies, and strategies
- ✓ Tools
- ✓ Publications
- ✓ State-specific information

**afdc.energy.gov**

# Questions?

John Gonzales

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