NATURAL GAS REFUSE VEHICLE WORKSHOP AND TOUR

Waste Management

Philadelphia Hauling Delaware Valley North
Bristol, PA

June 16, 2015

Rob Graff
Manager, Office of Energy and Climate Change Initiatives
Delaware Valley Regional Planning Commission
Pennsylvania Partnership to Promote Natural Gas Vehicles

Partners:

• Delaware Valley Regional Planning Commission
• Eastern PA Alliance for Clean Transportation (EP-ACT)
• Pittsburgh Region Clean Cities
• PECO Energy
• PGW
• Pennsylvania Department of Environmental Protection

Funded by US Department of Energy through January 2016
Pennsylvania Partnership to Promote Natural Gas Vehicles

- Target Fleets: Municipal Waste (Public and Private) and School Bus (Public and Private)
- Activities: Workshops, Informational Materials, and Tools (e.g. Guidebook, Fuel Use and Cost Calculators)
Our Goals For Today

• Provide unbiased information about the pluses and minuses of CNG refuse vehicles.
• Provide information on resources.
• Answer your questions.
• Show you CNG trucks, fueling stations, maintenance shop.
• Allow for informal Q&A, both on tour, and over pizza.
• Continued conversations after today
Who is in the Room?

- Location
- Number of Trucks (front loader, rear loader, roll-off)
- Familiarity with natural gas powered trucks
- Where do you currently fuel?
- Where do you do maintenance?
- Do you plow snow with refuse vehicles?
Overview of the Day

I. WELCOME
   Rob Graff – DVRPC

II. WASTE MANAGEMENT’S EXPERIENCE
   Jim Pryor – Waste Management

III. CNG ENGINES AND CHASSIS
   Barry Carr – Landi Renzo USA / Clean Cities of Central New York

IV. CNG REFUSE BODY CONFIGURATIONS
   Jamie Wackerman – McNeilus Truck & Manufacturing, Inc.

V. CNG FUELING OPTIONS
Overview of the Day

VI. OTHER RESOURCES
   Rob Graff – DVRPC

VII. QUESTIONS AND ANSWERS
   All Panelists

VIII. TOUR OF WASTE MANAGEMENT’S FUELING AND MAINTENANCE FACILITIES

IX. LUNCH – NEAPOLITAN EXPRESS – A CNG POWERED FOOD TRUCK SERVING PIZZA COOKED WITH NATURAL GAS
CNG Benefits

Reduced Price
- Around a $1.50 price differential ($3.50 gasoline to $2.00 CNG)***

Cleaner Burning
- Greenhouse gases 22% less than diesel vehicles; 29% less than gasoline vehicles*
- Greater than 90% reduction CO & particulates**

Domestically Sourced
- Greater than 90% of our natural gas is produced within the US, with much here in PA

*Wells-to-wheels figures developed for CARB reported via NGVA; common methane gas – bio-methane can be 90% or greater depending on source
**NREL Light Duty Emissions Test
*** Including applicable highway fuel taxes
Key Questions

What is Compressed Natural Gas (CNG)?
Can a CNG vehicle do what my diesel vehicle can do?
Will the savings in fuel cost be enough to pay for the CNG trucks?
Where will I fuel?
Where can I maintain my CNG trucks?
Provides a clear overview of the issues for refuse fleets to evaluate as they consider whether CNG is an appropriate fuel, from an economic standpoint.

- Unbiased
- Funded by US DOE, **NOT** by the natural gas industry, vehicle manufacturers, or fuel system vendors.
- Updated and customized for Pennsylvania.
Appendix H. Natural Gas Vehicle Project
Planning Checklist

Checklist for Refuse Fleets Owning and Operating Vehicles

The checklist below is intended to serve as a guide for fleet managers in adopting natural gas as a fuel for fleet vehicles. This is not an exhaustive outline of the details necessary for a successful project, rather, it provides an overview of the basic steps involved. Fleet managers are encouraged to consult with experts in the natural gas industry for additional information.

- Understand the basics of natural gas and CNG vehicles (Section 3, page 13)
  - Be familiar with how natural gas is used as a fuel and what characteristics differ from conventional petroleum fuels.

- Assess fleet vehicle characteristics (Section 3, page 15)
  - Outline vehicle route characteristics and typical vehicle use (average annual miles per year), average vehicle age of the vehicles to be replaced, etc. Are there any special characteristics with these vehicles that would make them more valuable for natural gas?

- Review CNG vehicle options (Section 3, page 16 and Appendix A)
  - What make and model of vehicle does the fleet prefer to purchase? Are there CNG options available in those truck models (or similar models)?

- Evaluate existing and planned CNG infrastructure (Section 3, page 17 and Appendix B)
  - Is the infrastructure available close to the fleet operation, or is a CNG station planned for somewhere nearby? Will the fleet need to construct its own refueling?

- Assess facility property (Section 3, Page 18)
  - If the fleet plans to build its own station, is there appropriate space available? Is there gas supply nearby? Would public access be feasible?

- Understand the corporate or municipal business/operations strategy (Section 3, Page 20)
  - If the fleet plans onsite refueling, will it be owned or provided by a third party? Who will maintain the station? How will it be financed? What payback period is needed?

- Evaluate infrastructure requirements (Section 3, Page 20)
  - What will be needed to meet fleet infrastructure needs? These must be clearly understood to issue a RFP for station construction.

- Assess the business case (Section 3, Page 21)
  - How quickly will the fleet’s investment in the CNG project be paid back with fuel cost savings? Does this fit with the fleet’s typical business practices and preferences?

- Develop an implementation plan and act on it (Section 3, Page 22)
  - Plan carefully for the number of natural gas vehicles to be purchased, the financing to be arranged for the vehicles (and infrastructure if needed), and procurement of fuel (long-term fuel purchase agreements are best if possible).

Flow Chart of Decisions – Natural Gas Refuse Vehicle Projects

- Is natural gas service available onsite or in your area? Do the vehicles return to the same central location every day? Do the vehicles regularly consume 30 DGE or more per day?
  - No
  - Yes

- Are CNG options available for the type of vehicles you require? Will you be replacing vehicles this year?
  - No
  - Yes

- Will CNG maintenance be available either by you or a nearby facility?
  - No
  - Yes

- Is there a publicly accessible CNG station that is convenient and capable (sufficient capacity and access) of supporting your fleet?
  - No
  - Yes

- Will your CNG fleet consume at least 250,000 gallons per year?
  - No
  - Yes

- Is your company capable and willing to have on-site fueling?
  - No
  - Yes

- Is sufficient natural gas supply available onsite?
  - No
  - Yes

- Is the CNG vehicle using your local public fueling stations a good option for your fleet?
  - No
  - Yes

- Are CNG vehicles an option in the future if a new public station opened in your area?
  - No
  - Yes

- Would your company prefer to own the station or have a third party take responsibility?
  - No
  - Yes

- Contact a full-service CNG infrastructure provider to determine if it is willing to invest in a station at your location. Sites that allow public fueling are typically more desirable to third parties because public fueling increases the site’s potential throughput.
Questions?

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www.dvrpc.org/EnergyClimate/P3NGV
This truck runs on natural gas. Another way we Think Green.
Waste Management Greater Mid-Atlantic Area
Jim Pryor Area Fleet Director

Natural Gas Evolution and Strategy at Waste Management

Think GREEN® Every Day.
History and Current Fleet

• WM started deploying NGV’s in the late 1990’s these 135 units were all LNG vehicles. The primary driver for this was reduction of NOX and Particulate Matter.
• WM currently operates the largest Class 8 Natural Gas Vehicle Fleet in North America with over 4100 NGV vehicles 25% CNG.
• WM currently has 76 stations across the country with 27 of them having retail access open to the public.
• The Greater Mid Atlantic Area currently operates 200 CNG vehicles and will grow to 260 (21%) by year end. The GMA covers NYC, NJ, Eastern Pa, DE and the Eastern Shore MD.
• GMA currently has CNG vehicles operating out of Bristol Pa, Pen Argyl, Camden, Trenton and Toms River NJ. We are in the design permitting phase of Dunmore Pa and Wilmington De.
• We offer public access in Bristol, Pen Argyl, Toms River and Camden, NJ.
CNG Front Loader

Peterbilt 320
Cummins ISLG Engine
330 HP
540 Cu In
1000 lbs torque
75 DGE CNG storage tanks
McNeilus 40 Yard Body
Rear Ratio
6.14 CNG vs 5.38 Diesel
CNG Rear Loader

Peterbilt 320
Cummins ISLG Engine
330 HP
540 Cu In
1000 lbs torque
75 DGE CNG storage tanks
25 Yard McNeilus Body
Rear Ratio
6.14 CNG vs 5.38 Diesel
CNG Rolloff

Peterbilt 365 Cummins ISLG Engine 330 HP 540 Cu In 8.9 Liter 1000lbs Torque
Galbreath RO 75 DGE CNG Tank Storage Rear Ratio 6.14 CNG vs 5.38 Diesel
Our CNG Trucks Have The Same Power and Performance as a Diesel Engine
CNG Station Major Components

Fast Fill Station / Fleet Access

WM Camden, NJ
Slow/Time Fill

WM Camden, NJ
CNG Station Major Components

Gas Dryer

Gas Meter
CNG Station Major Components

CNG Spherical Storage Tanks  CNG Compressors (2)
CNG Station Major Components

Control Panel

Electrical Switch Gear
CNG Slow Fill Pole At CNG Parking

Manual Shutoff Valve on Pole

Emergency Shutdown Buttons
1. Connect Nozzle and Point Arrow on Lever to Red Hose to Fill

2. Point Arrow to Steel Tube to Vent BEFORE disconnecting

3. Pull Yellow Sleeve Back to Disconnect

Type 2 CNG Connector
Fuel Fill (FAST)

Fuel Fill (SLOW)

Tank Pressure 0-5000 PSI

Pressure to Engine 0-300 PSI

Manual Shutoff

Defueling Valve
CNG Cylinders

Each Cylinder has the following:

- Manual Shutoff Valve
- Pressure Relief Device (PRD)
CNG Safety

- CNG has a higher flashpoint and auto-ignition temperature than diesel fuel
- CNG cylinder tanks must undergo the same crash tests as other vehicles
- Federal Motor Vehicle Safety Systems (FMVSS) 304 standard requires inspection of CNG cylinders every three years or 36,000 miles
- Employees are trained upon employment and retrained every two years
- Training is conducted with local fire departments and first responders on our CNG stations and vehicles
- Methane detection systems are installed in the cabs and engine compartments in our trucks
- Maintenance facilities are retro-fitted and methane detection systems are installed.
CNG Safety – The Design Works

This WM CNG vehicle had trash inside of the body caught fire. During the fire, the CNG tanks and enclosure were fully involved. The Pressure Relief Devices (PRDs) on the tanks did exactly what they were designed to do, vent the gas to the atmosphere. The four CNG tanks held up to the extreme heat from the fire and the fire was safely extinguished by the fire department.
Conclusions and direction for Natural Gas

• CNG is the mobile fuel of choice, dependable, lower cost
• Clean burning, lower PM and GHG emissions, quieter
• Natural Gas technology is “stackable”, IE. Hybrid, Electric
• Our Customers are requesting it example, Hamilton, Princeton, West Windsor NJ
• Diesel DPF retrofit technology is not suitable for the WM duty cycle
• 2007 Diesel emission technology is not suitable for the WM duty cycle
• 2010 Diesel emission technology is not suitable for the WM duty cycle
• Better payload
• Abundant and stable fuel source
• Less dependence on Foreign oil
Thank You!
CNG REFUSE BODY CONFIGURATIONS

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Fueling Options for Natural Gas Refuse Vehicles

Presented by:
Graham Barker
Eastern Region Sales Manager
ANGI Energy Systems
Who is ANGI?

- We are a focused, worldwide supplier of CNG refueling systems with over 30 years of experience.
ANGI’s Facility

> 215,000 ft² on 14 acres in Janesville, Wisconsin
> 160,000 ft² of flexible manufacturing space with 32 ft. high bays
> 24 overhead bridge cranes with lift capacities to 15 tons
> Welding, fabrication, warehouse, paint, and panel build areas
> Multi use assembly bay with capability for lean flow of standardized products and cellular layout of highly customized equipment
> Present double shift plant capacity 250 pkgs./yr.
> 7,000 ft² R&D center for product development & validation testing
> 55,000 ft² modernized office space
Station Design Options
Time Fill System

A cost effective fueling option that allows vehicles to conveniently refuel overnight or when the vehicles are not in use.
Fast Fill System

Provides immediate dispensing of CNG to vehicles ranging from passenger cars and fleet trucks to transit buses.
Combination System

Features both a fast fill and time fill system allowing high utilization of the compression capacity both day and night.
Station Design Considerations
How Much Fuel in How Much Time?

> What is the projected number of vehicles per day & per hour, and what is the required amount of fuel per day and per vehicle?

> What are the fueling patterns?
  - Are all vehicles fueled at once?
  - Can they be staggered throughout the day?
  - Are there peak fill times?

> What are the maximum **daily** and **hourly** flows?
Station Location Considerations

> **Offsite:** Use an existing public access station if available.

> **Onsite:** Private access only

> **Onsite:** With public access “outside the fence”

> **Location:** Fleet & Traffic access
   Competition with other

> **Property Size:** Space required for equipment footprint
   Space required for vehicle traffic (including number of islands and vehicle entry/exit)

> **Development:** Potential remediation of an existing fuel site
   Local permitting, Codes & Regulations
Fleet Refueling Stations

> Light/Heavy Duty vehicles
> Trash trucks/Refuse/Vocational Fleets
> Public refueling options
> ROI
Retail Refueling Stations
CNG Fueling Stations In Greater Philadelphia
Questions?
THANK YOU

Contact Information:

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Off: 608-563-2883        Cell: 203-394-7889
Other Resources For CNG Refuse Vehicles

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Delaware Valley Regional Planning Commission
How Your Gas Utility Can Help Facilitate Projects

✓ Cost estimates for gas service
  • Proximity to main
  • Pressure and availability
✓ Coordination of construction
  • Applications and scheduling
✓ Pricing
  • Best-fit rate classification
  • Special tariffs
✓ Grants and incentives

Information typically required
✓ Equipment size and specifications
  • Fast-fill or time-fill station
  • Fuel input rate (max per hour)
  • Electric power requirements
  • Plans for future expansion
✓ Annual gas volume estimates
  • Types and number of vehicles
  • Existing fuel usage and type for vehicles to be converted
  • Public stations: Sales forecast and marketing/outreach plans
  • Private stations: Conversion schedule

Cleaner, Cheaper, Domestic
Contact your local gas utility for detailed offerings:

**Contact Information**

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PGW  
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Commonwealth Funding for NGV

- ACE  funding for fueling  
- AFIG  funding for 50% up-fit *  
- NVG  past funding for 50% up-fit  
  >14,000 lbs. GVW  
  Not Currently Open  

Heather Cowley, Regional Energy Manager  
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Services

What can we do for You?

• Workshops/ educational seminars
• Training
• Fleet Analysis
• Facility Analysis
• Informational Resources
• Market Research
• Incentives
• Grant Writing
• Grant Administration
• Project Management

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Codes and Permitting Webinar

Code Related Modifications For NGVs In Existing Maintenance Facilities
- Steve Arnold, P.E. - Engineering Vice President – ET Environmental
- Brian Bogar, P.E. - Senior Design Manager – ET Environmental

Installation Guidance: CNG Refueling Stations
- Ted Barnes – Gas Technology Institute

GNG Fueling On the Ground Experience in the Region
- Charlie Stevenson – Aqua America

DATE: Mid-July. We will send information out and have it on our web site.
Questions and Discussion