



# 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:**

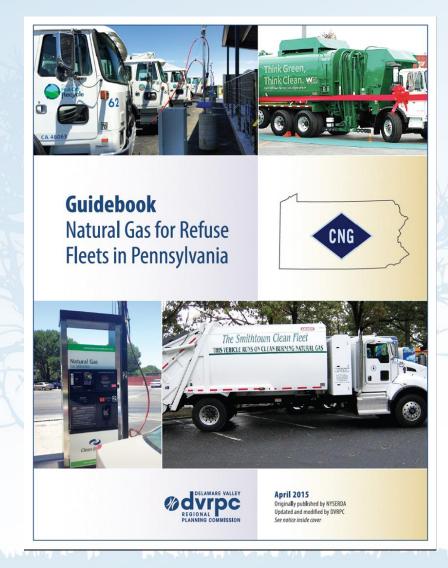
- Delaware Valley Regional Planning Commission
- Eastern PA Alliance for Clean Transportation (EP-ACT)
- Pittsburgh Region Clean Cities
- PECO Energy
- PGW
- Pennsylvania Department of Environmental Protection

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

  Graham Barker ANGI Energy Systems, Inc.



### **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



<sup>\*</sup>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

<sup>\*\*\*</sup> 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?

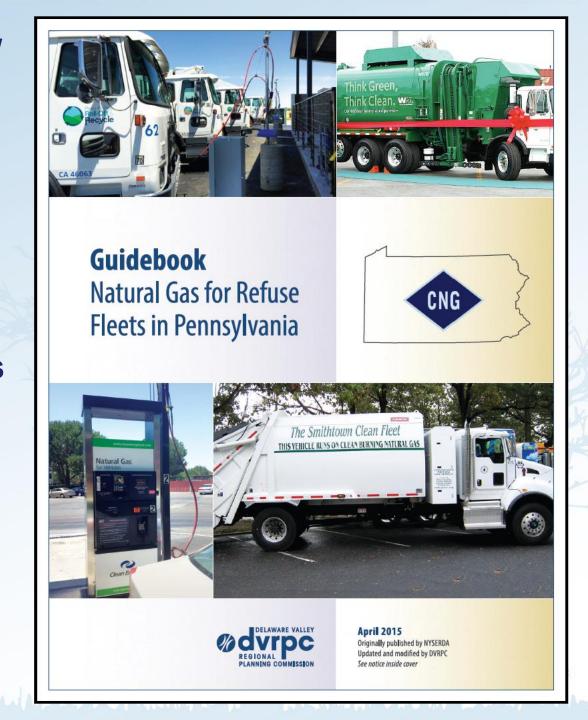
Where will I fuel?

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,
   <u>NOT</u> by the natural gas
   industry, vehicle
   manufacturers, or fuel
   system vendors.
- Updated and customized for Pennsylvania.



### Natural Gas Vehicle Project – Decisions Flow Chart

### 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 unsuitable 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 these truck models (or similar models)?

Evaluate existing and planned CNG infrastructure (Section 3, page 17 and Appendix F)

. Is fueling 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 viable?

Understand the corporate or municipal business/operations strategy (Section 3, Page 20)

. If the fleet plans onsite fueling, 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?

### Examine 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).

# **APPENDIX**

### Flow Chart of Decisions - Natural Gas Refuse Vehicle Projects The flow chart below provides an alternative look at the steps and decisions to be made in planning for a natural gas vehicle project. This supplements the prior checklist. CNG vehicles are Is natural gas service available onsite or in your area? probably not right Do the vehicles return to the same central location every day? for your fleet. Do the vehicles regularly consume 20 DGE or more per day? CNG might be an option in the Are CNG options available for the type of vehicles you require? future when you Will you be replacing vehicles this year? are ready to Will CNG maintenance be available either by you or a nearby facility? replace vehicles or as technology options increase. Is there a publicly accessible CNG station that is convenient and capable (sufficient capacity and access) of supporting your fleet? CNG might be an option in the future if a new Will your CNG fleet consume Will your CNG fleet consume at public station least 250,000 gallons per year? opened in your at least 250,000 gallons per area. Contact your Is your company capable and local Clean Cities willing to have on-site fueling? Is your company capable and Coalition to notify Is sufficient natural gas supply willing to have on-site fueling? it of your interest. Is sufficient natural gas supply available on-site? LNo ↓ Yes Yes CNG vehicles using Would your company prefer to own the station or have a third party your local public fueling station is a Can a public/private partnership be established to allow public access good option for with an on-site CNG refueling station if the business is in a good your fleet. location to attract other CNG vehicles? Outsource to Third Party Allowing public refueling may make you eligible Contact a full-service CNG infrastructure for more funding opportunities and a chance to provider to determine if it is willing to increase your return on investment, but it is more invest in a station at your location. Sites expensive. If only private refueling, investigate a that allow public fueling are typically time-fill fueling solution to reduce costs. Decide more desirable to third parties because who will handle operation and maintenance of the public fueling increases the site's station and pursue a CNG fleet. potential throughput. - H-2 -

### **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



**Fast Fill Station / Fleet Access** 



# Slow/Time Fill



**Gas Dryer** 

**Gas Meter** 





**CNG Spherical Storage Tanks** 

**CNG Compressors (2)** 



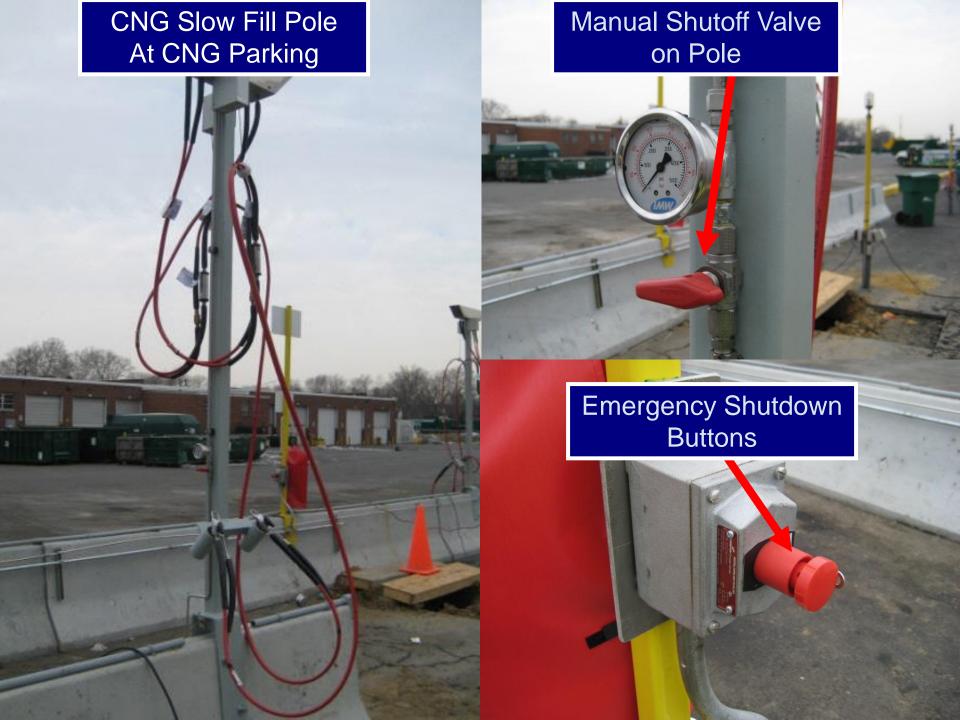


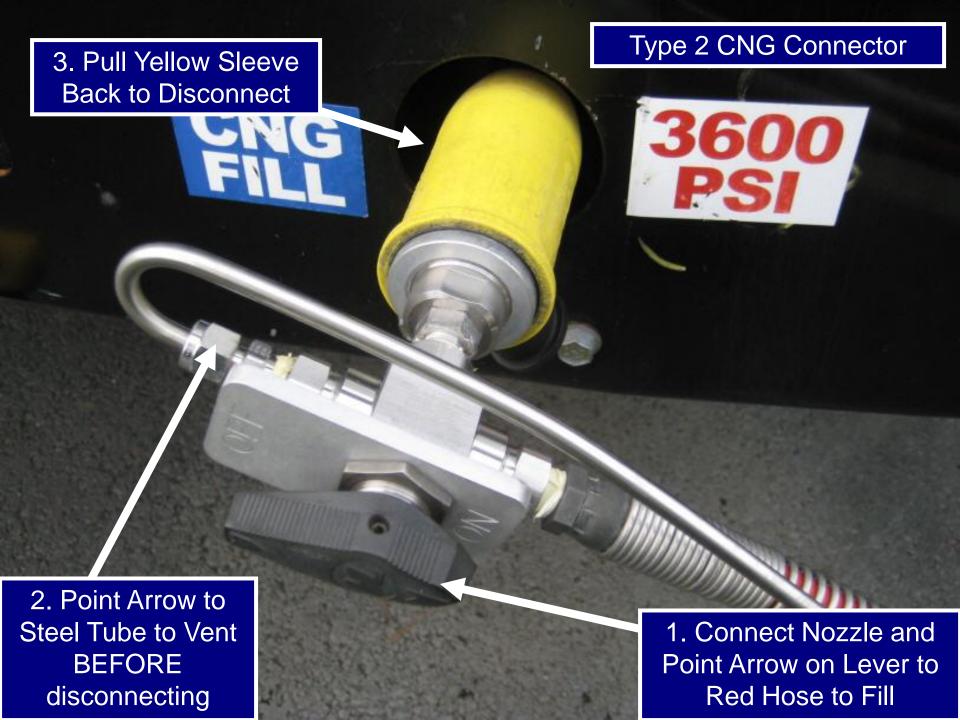
**Control Panel** 

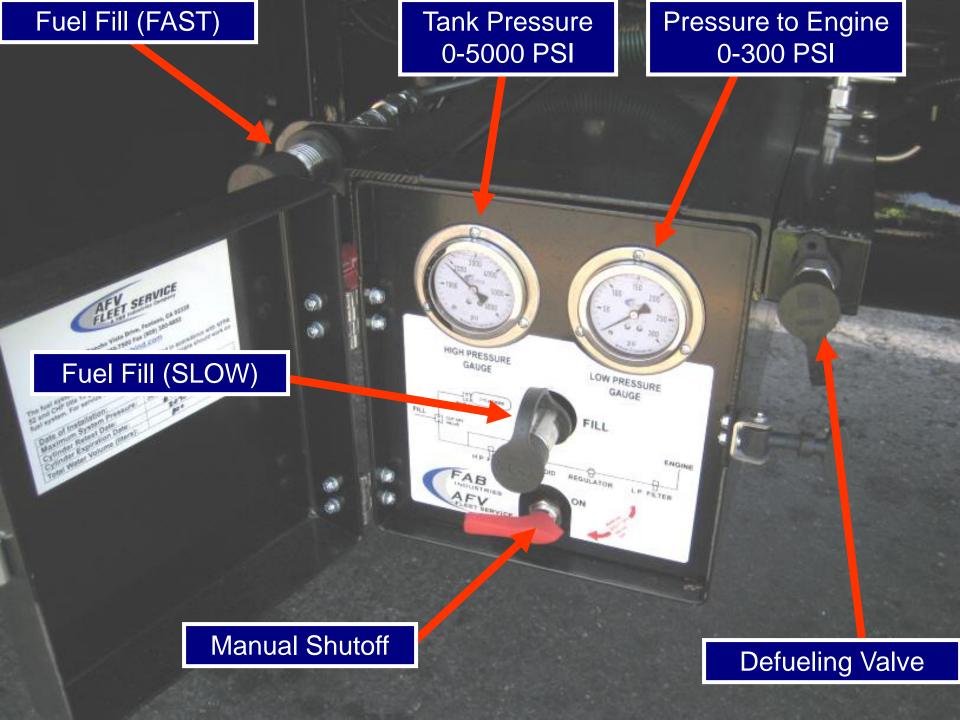
**Electrical Switch Gear** 

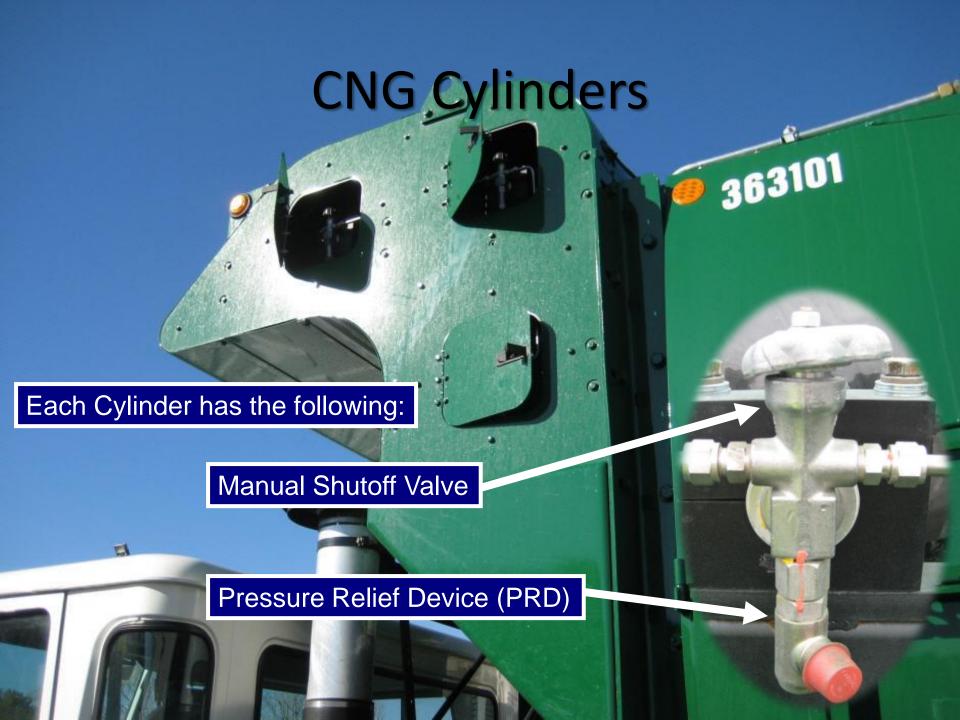












### **CNG Safety**

- 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 catch 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.





**PRD Valve** 

### 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

Jamie Wackerman Regional Sales Manager McNeilus mcneiluscompanies.com 941 Hemlock Road Morgantown, PA 19543

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Cell:610.223.0999

jwackerman@mcneilusco.com



An Oshkosh Corporation Company



# 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 ft<sup>2</sup> on 14 acres in Janesville, Wisconsin
- > 160,000 ft<sup>2</sup> 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 ft<sup>2</sup> R&D center for product development & validation testing





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# Station Design Options

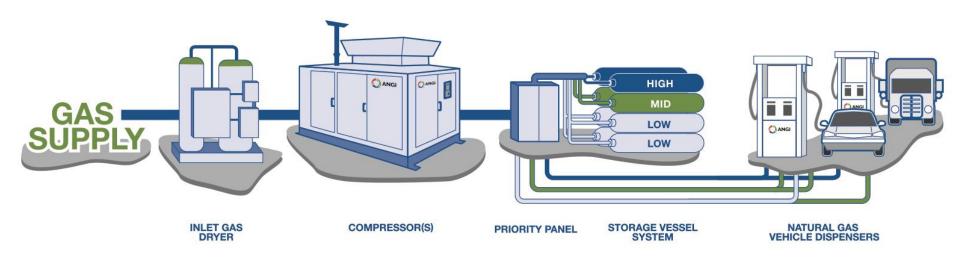
## **Time Fill System**



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

ANGI

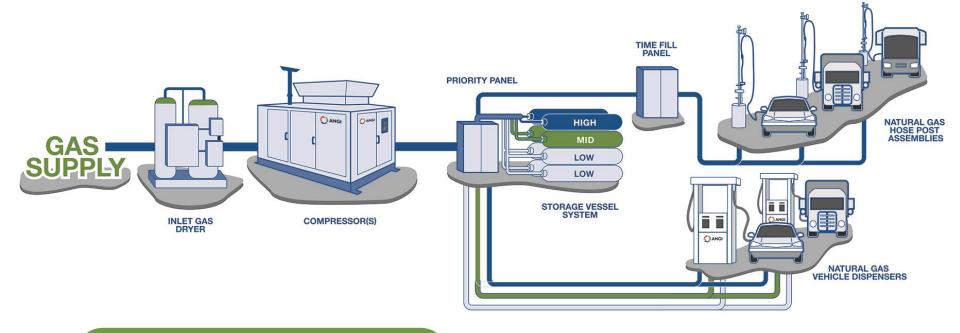
## **Fast Fill System**



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



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## **Retail Refueling Stations**





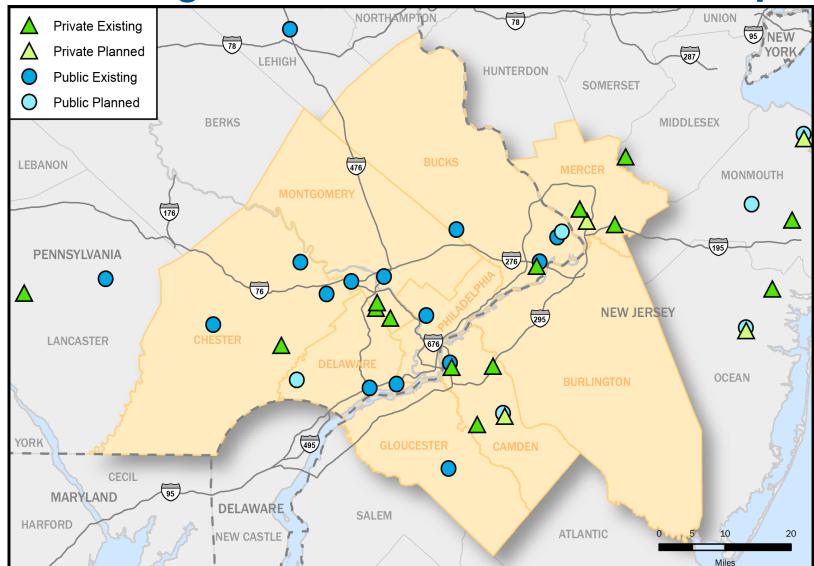




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**CNG Fueling Stations In Greater Philadelphia** 



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## Questions?



## THANK YOU

**Contact Information:** 

gbarker@angienergy.com

Off: 608-563-2883 Cell: 203-394-7889





## Other Resources For CNG Refuse Vehicles Delaware Burlington

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

### 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

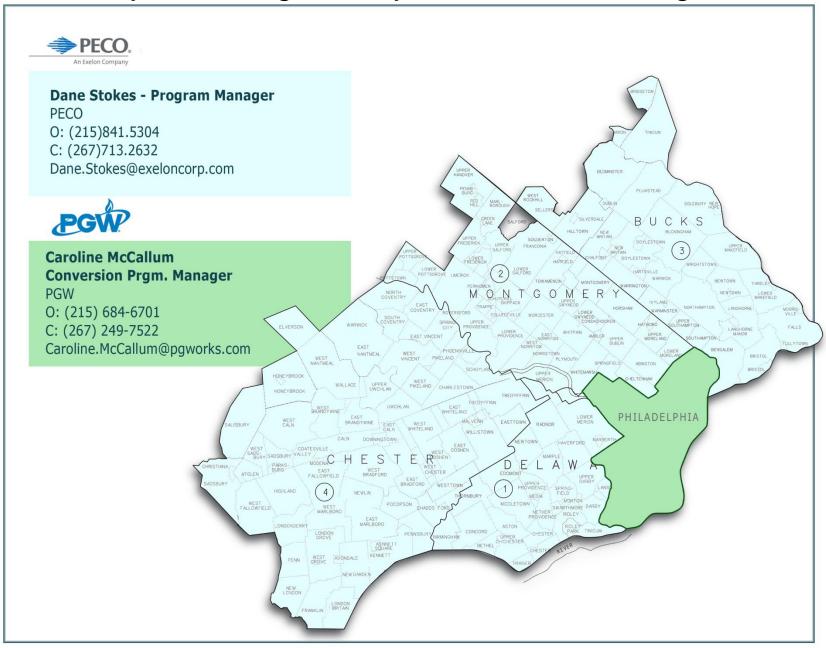
- ✓ Equipment size and specifications
  - Fast-fill or time-fill station
  - Fuel input rate (max per hour)
  - Electric power requirements
  - Plans for future expansion
- ✓ Annual gas volume estimates
  - Types and number of vehicles
  - Existing fuel usage and type for vehicles to be converted
  -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







### Contact your local gas utility for detailed offerings:











#### Policy Office

### 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 # Out of Funds

Heather Cowley, Regional Energy Manager
PA DEP Southeast Regional Office
484.250.5816 <a href="mailto:hcowley@pa.gov">hcowley@pa.gov</a>

### **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



Tony Bandiero
Executive Director
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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.

