



PECO CNG PROGRAM

Clean Cities Presentation

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What is a CNG?

- ✓ NGV (Natural Gas Vehicle) is the overarching term for both CNG and LNG
 - CNG – Compressed Natural Gas powered vehicles
 - LNG (Liquefied Natural Gas) is also used in vehicles, but NOT directly marketed to customers by PECO

- ✓ CNG - Fuel compressed up to 3600 PSI to allow for storage on-vehicle
 - Allows for 60 times greater energy density
 - Tank(s) can be similar size to gasoline tank, and/or sized to provide similar vehicle range

- ✓ Vehicle operates the same way it is currently used
 - No power difference
 - Similar range can be obtained if tanks are sized correctly
 - Available in most models and vehicle sizes, from Honda Civic to 18-Wheelers

Current Vehicles



*Courtesy of NGVA

CNG Implementation

✓ Station

- Built to compress pipeline gas (2-99 PSI) up to 3600 PSI

✓ Multiple CNG fueling options can be provided to customers depending on their needs:

- On-site customer station construction
- Private/Public station construction
- Public retail stations

✓ Fueling methods

- Fast fill: Similar to current liquid fuel process
- Slow fill: Vehicle fills when not operating over several hours

CNG Implementation

- ✓ Vehicle modified to run on Natural Gas
 - Can be purchased directly from fleet dealers

- ✓ Different CNG Vehicle Types
 - Dedicated CNG: Runs on only CNG all of the time
 - Bi-Fuel: Can run on CNG or Gasoline, can switch while vehicle is running full speed
 - Dual Fuel: Runs on a mixture of Diesel and CNG at all times

- ✓ Maintenance Facilities Upgrades
 - Methane Detectors
 - Train staff on CNG maintenance and safety

CNG Benefits

Clean burning, Domestic fuel, at a reduced price

✓ Cleaner Burning

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

✓ Domestic

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

✓ Reduced Price

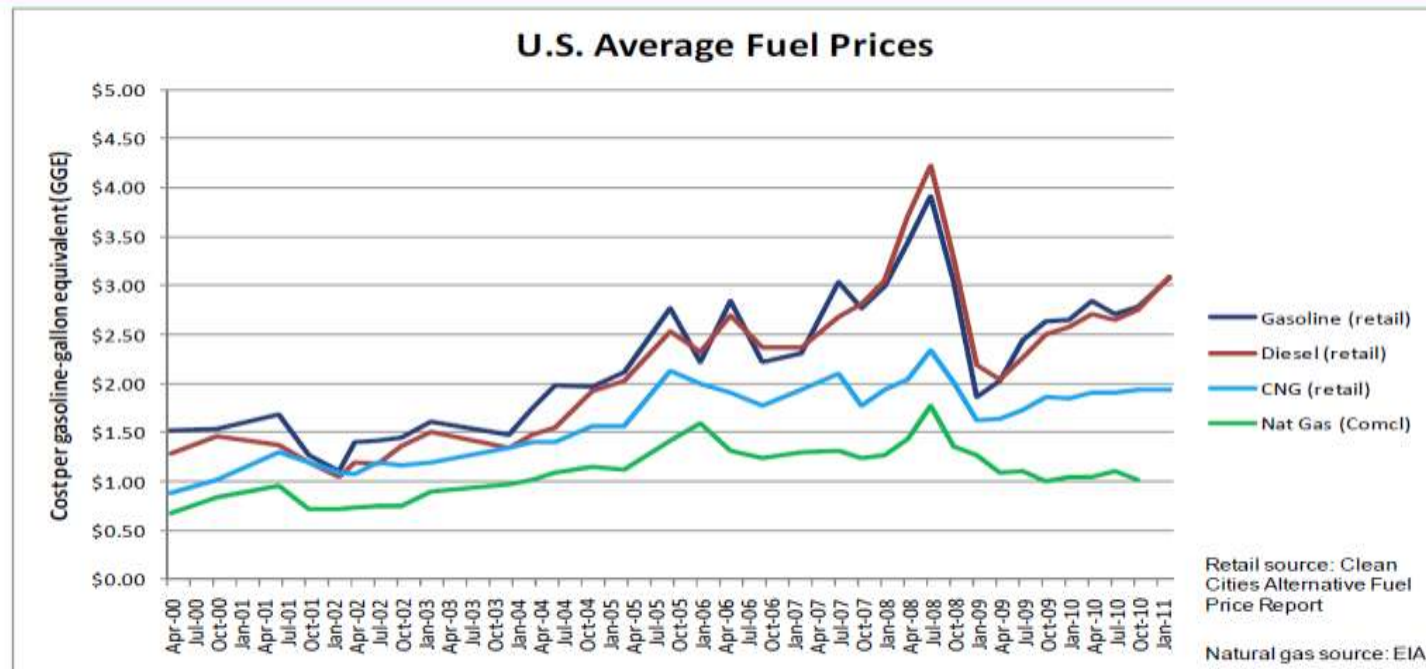
- Around a \$2.00 price differential (\$4.00 gasoline to \$2.00 CNG)

*Wells-to-wheels numbers for developed for CARB reported via NGVA; common methane gas – bio-methane can be 90% or greater depending on source

**NREL Light Duty Emissions Test

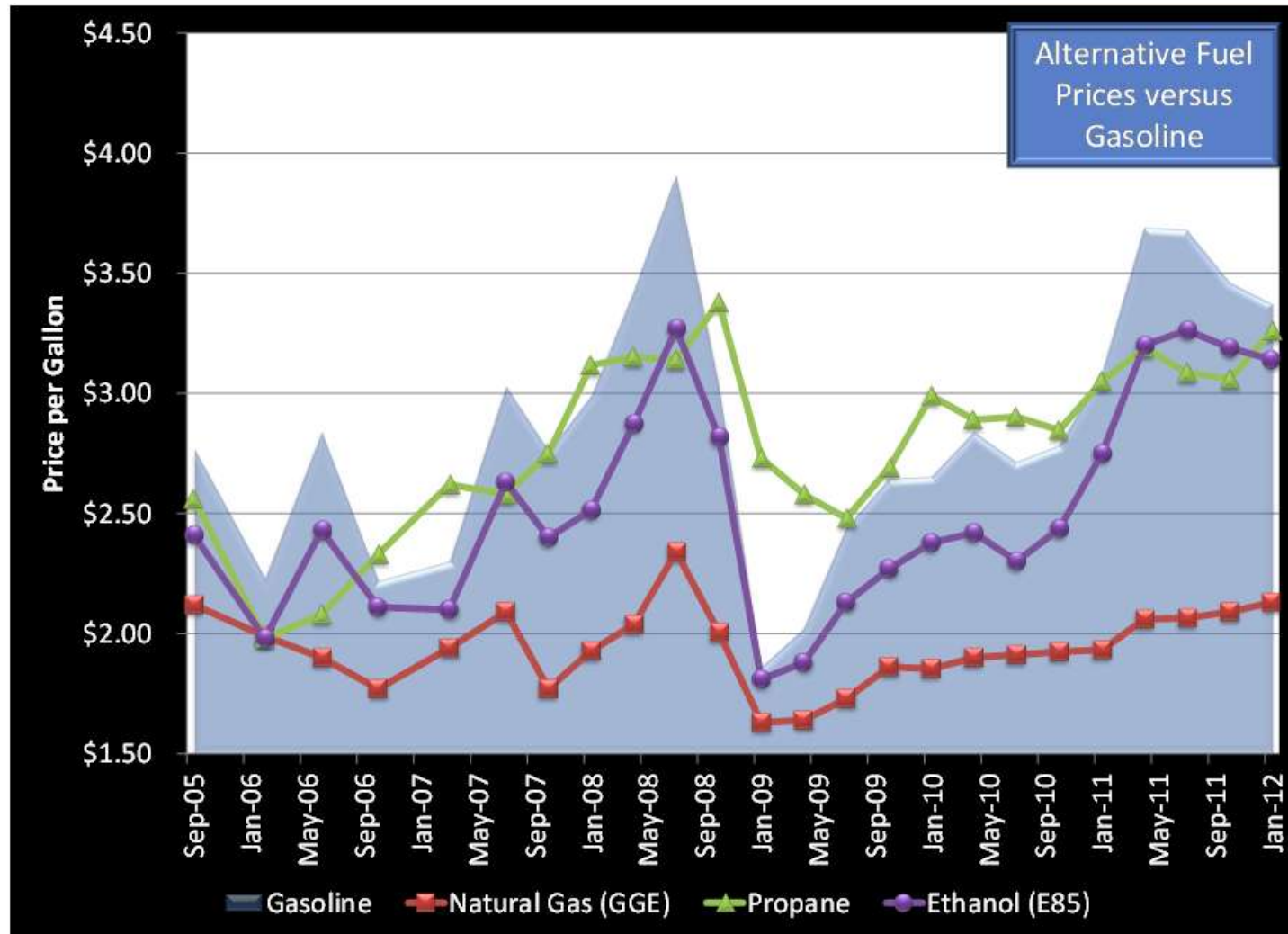
CNG Fuel Comparison

Primary Driver: Fuel Cost Savings & Predictability

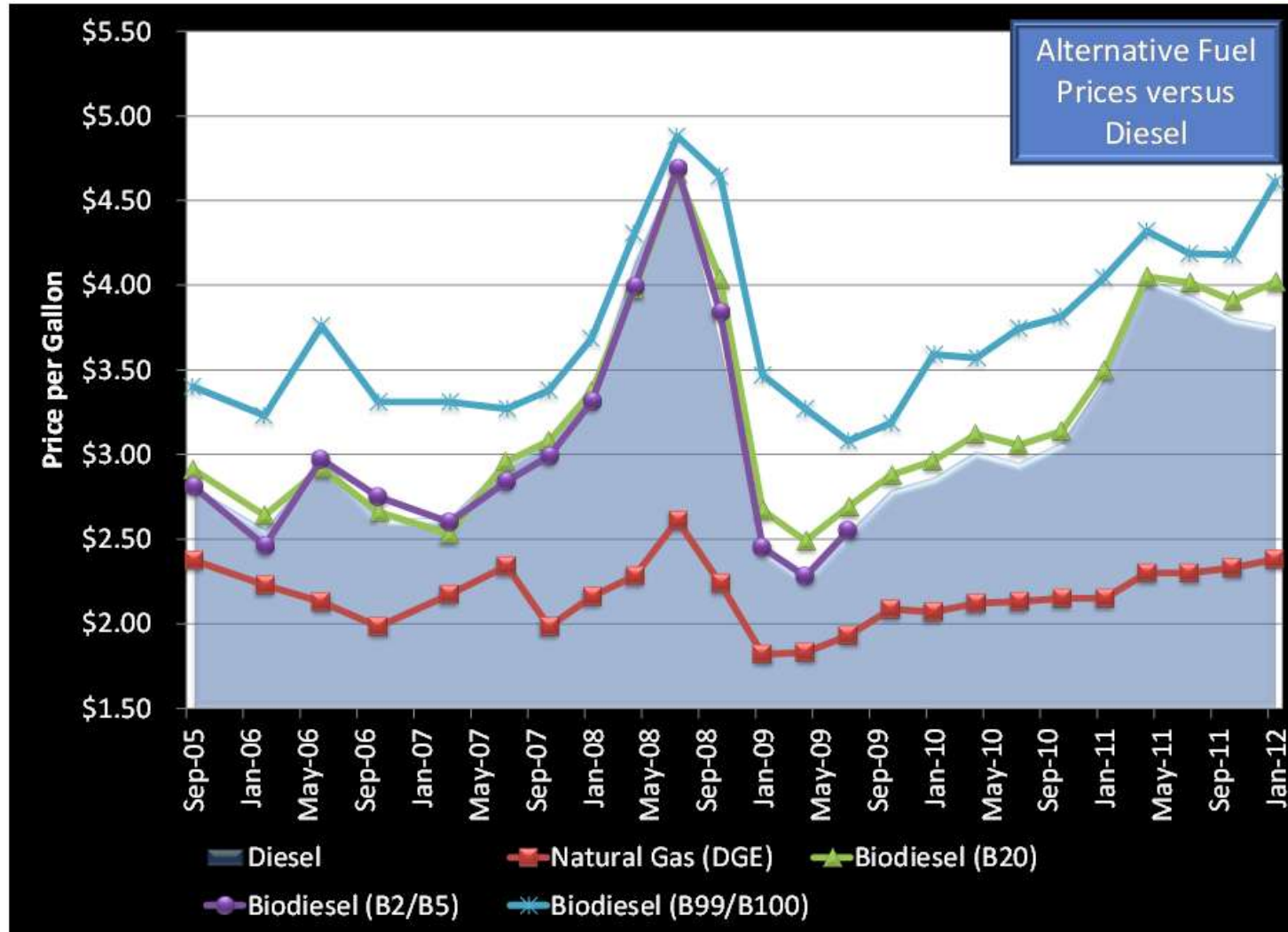


- Retail CNG is much less volatile than diesel and gasoline
 - Commercial natural gas is even less volatile

CNG Fuel Comparison



CNG Fuel Comparison



CNG Fleet Characteristics

- ✓ Large Fleet operating from a Common Depot
- ✓ Regular Routes with short to medium length, centralized to a local area
- ✓ High fuel use associated with large or heavy vehicles
- ✓ High fuel use due to high mileage and/or long operating hours
- ✓ Available CNG vehicle models in the market
- ✓ Green initiatives in industry, and/or reduced noise requirements
- ✓ Proven industry successes with CNG nationally

CNG Conversion Decision Process

DRIVERS

Type of Vehicles	<ul style="list-style-type: none"> - Availability - Size for tank
Size of Fleet	<ul style="list-style-type: none"> - Public Station - Dedicated Station
Range	<ul style="list-style-type: none"> - Short - Long - Sta. access
Total Ownership Cost	<ul style="list-style-type: none"> - Acquisition - Maintenance - Fuel cost
Location	<ul style="list-style-type: none"> - Depot - Main - Night/Fast
Industry	<ul style="list-style-type: none"> - Standards - Requirements - Green Goals
Financing	<ul style="list-style-type: none"> - Grants - Loans - Tax Incentive

DECISION POINT



BENEFITS

<p>CNG FUEL</p> <ul style="list-style-type: none"> - Lower fleet fuel costs - More predictable fleet fuel costs - Less GHG emissions - Cleaner burning, less maintenance - Domestic fuel
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<p>ANOTHER ALTERNATIVE FUEL</p> <ul style="list-style-type: none"> - Easier conversion - Available vehicles and fueling stations - No fueling behavior changes - Less range issues

<p>NO FUEL CHANGE</p> <ul style="list-style-type: none"> - No additional capital required - No additional mechanic training - No fueling behavior changes - Predictable maintenance - Available vehicles and fueling stations

Refuse Haulers – Customer Case

CNG Vehicles

One Truck

- Annual fuel use
 - o 10,000 dge per year (1,340 Mcf)
 - Diesel \$4.00 gal = \$40,000
 - CNG \$1.99 dge = \$19,900
- Annual fuel cost savings = \$20,100
- Incremental cost of CNG truck \$30,000
- **Simple payback 1.49 years** (12 year truck life)



Fleet with station construction

- | | |
|---|---|
| <ul style="list-style-type: none"> - <u>Slow fill</u> station construction cost \$500,000 - 30 CNG trucks <ul style="list-style-type: none"> o Incremental cost of CNG trucks = \$900,000 o Annual fuel cost savings = \$603,000 o Simple payback 2.32 years | <ul style="list-style-type: none"> - <u>Fast fill</u> station construction cost \$1,500,000 - 30 CNG trucks <ul style="list-style-type: none"> o Incremental cost of CNG trucks = \$900,000 o Annual fuel cost savings = \$603,000 o Simple payback 3.98 years |
|---|---|

Due to high annual fuel use, the business case for refuse companies converting to CNG is strong.

- Most customer costs built into CNG price (electric, operations, maintenance); based on WM retail cost
- annual fuel usage estimate from NGVA, will vary
- cost differential will shift as diesel and CNG prices fluctuate
- incremental vehicle costs from NGVA, will vary depending on specifications
- station construction costs are estimates
- estimated life of refuse trucks, 12 years according to NREL
- No federal or state incentives included, none currently available

Service/Delivery Companies – Customer Case

CNG Vehicles

One Step Van

- Annual fuel use
 - o 4,153 dge per year (557 Mcf)
 - Diesel \$4.00 gal = \$16,612
 - CNG \$1.99 dge = \$8,264
- Annual fuel cost savings = \$8,348
- Incremental cost of CNG van \$20,000
- **Simple payback 2.40 years** (10 year van life)



Fleet with station construction

- | | |
|--|--|
| <ul style="list-style-type: none"> - <u>Slow fill</u> station construction cost \$500,000 - 50 CNG step vans <ul style="list-style-type: none"> o Incremental cost of CNG vans = \$1,000,000 o Annual fuel cost savings = \$417,400 o Simple payback 3.59 years | <ul style="list-style-type: none"> - <u>Fast fill</u> station construction cost \$1,200,000 - 50 CNG step vans <ul style="list-style-type: none"> o Incremental cost of CNG vans = \$1,000,000 o Annual fuel cost savings = \$417,400 o Simple payback 5.27 years |
|--|--|

Due to annual fuel use and savings, an acceptable pay back period is achieved.

- Most customer costs built into CNG price (electric, operations, maintenance); based on WM retail cost
- annual fuel usage estimate from NGVA, will vary
- cost differential will shift as diesel and CNG prices fluctuate
- incremental vehicle costs from NGVA, will vary depending on specifications
- station construction costs are estimates
- estimated life of a step van, 10 years according to NGVA
- No federal or state incentives included, none currently available

School Districts – Customer Case

CNG Vehicles

One School Bus

- Annual fuel use
 - o 2,650 dge per year (355 Mcf)
 - Diesel \$4.00 gal = \$10,600
 - CNG \$1.99 dge = \$5,273
- Annual fuel cost savings = \$5,327
- Incremental cost of CNG bus \$31,000
- **Simple payback 5.82** (15 year bus life)



Fleet with station construction

- Slow fill station construction cost \$600,000
- 75 CNG school buses
 - o Incremental cost of CNG buses = \$2,325,000
 - o Annual fuel cost savings = \$399,525
 - o **Simple payback 7.32**
- Fast fill station construction cost \$1,200,000
- 75 CNG school buses
 - o Incremental cost of CNG buses = \$2,325,000
 - o Annual fuel cost savings = \$399,525
 - o **Simple payback 8.82 years**

Due to low annual fuel use from low mileage, grants are required for the business case to work

- Most customer costs built into CNG price (electric, operations, maintenance); based on WM retail cost
- annual fuel usage estimate from NGVA, will vary
- cost differential will shift as diesel and CNG prices fluctuate
- incremental vehicle costs from NGVA, will vary depending on specifications
- station construction costs are estimates
- estimated life of a school bus, 15 years according to NREL
- No federal or state incentives included, none currently available

Transit Systems – Customer Case

CNG Vehicles

Bus

- Annual fuel use
 - o 10,672 dge per year (1,430 Mcf)
 - Diesel \$4.00 gal = \$42,688
 - CNG \$1.99 dge = \$19,900
- Annual fuel cost savings = \$21,237
- Incremental cost of CNG transit bus \$50,000
- **Simple payback 2.35 years** (15 year transit bus life)



Fleet with station construction

- | | |
|---|---|
| <ul style="list-style-type: none"> - <u>Slow fill</u> station construction cost \$1,000,000 - 50 transit buses <ul style="list-style-type: none"> o Incremental cost of CNG buses = \$2,500,000 o Annual fuel cost savings = \$1,062,000 o Simple payback 3.30 years | <ul style="list-style-type: none"> - <u>Fast fill</u> station construction cost \$2,000,000 - 50 transit buses <ul style="list-style-type: none"> o Incremental cost of CNG buses = \$2,500,000 o Annual fuel cost savings = \$1,062,000 o Simple payback 4.24 years |
|---|---|

Due to high annual fuel use of transit buses, the business case for converting to CNG is strong.

- Most customer costs built into CNG price (electric, operations, maintenance); based on WM retail cost
- annual fuel usage estimate from NGVA, will vary
- cost differential will shift as diesel and CNG prices fluctuate
- incremental vehicle costs from NGVA, will vary depending on specifications
- station construction costs are estimates
- estimated life of a transit bus, 15 years according to NREL
- No federal or state incentives included, none currently available

Customer Case – other vehicles

One F-350 Pickup Truck

- Annual fuel use @20,000 miles per year
 - o 1,200 gge per year (144 Mcf)
 - Gasoline \$3.50 gal = \$4,200
 - CNG \$1.80 gge = \$2,160
- Annual fuel cost savings = \$2,040
- Incremental cost of CNG truck \$12,000
- Simple payback 5.88** (8 year truck life)



One Taxi

- Annual fuel use @60,000 miles per year
 - o 3,400 gge per year (400 Mcf)
 - Gasoline \$3.50 gal = \$11,872
 - CNG \$1.80 gge = \$6,105
- Annual fuel cost savings = \$5,767
- Incremental cost of Taxi \$ 6,000
- Simple payback 1.04** (3-4 year taxi life)



One Shuttle Van

- Annual fuel use @80,000 miles per year
 - o 5,000 gge per year (600 Mcf)
 - Gasoline \$3.50 gal = \$17,500
 - CNG \$1.80 gge = \$9,000
- Annual fuel cost savings = \$8,500
- Incremental cost of CNG van \$15,000
- Simple payback 1.76** (4 year van life)



Growth of CNG in PECO Region

EXISTING

21,068 Mcf annually

13 Active CNG fueling stations

Lower Merion School District
 - Private Station – 12,000 Mcf

Printing Company
 - Private Station – 5,700 Mcf

PECO Facilities (5)
 - Public Stations – 1,643 Mcf

West Chester University
 - Private Station – 1,200 Mcf

Other (5)
 - Private stations – 525 Mcf

IN PROGRESS

337,900 Mcf annually

5 New CNG stations

Clean Energy, Philadelphia Airport
 - 104,000 Mcf / target install 5/12

Lehigh Gas (2), KOP & Concordville
 - 36,600 Mcf / target install 5/12

Clean Energy, Fairless Hills
 - 104,000 Mcf / target install 7/12

Waste Management, Bristol
 - 93,300 Mcf / target install 10/12

FUTURE

3,504,000 Mcf

Estimate of Total Target Market*

Refuse
 - 1,934,000 Mcf annual estimate

Service\Delivery
 - 155,000 Mcf annual estimate

Schools
 - 1,272,000 Mcf annual estimate

Other, suburban transit buses
 - 143,000 Mcf annual estimate

*All target fleets convert to CNG

PECO Territory CNG Stations

February PECO CNG Station Map 2



CNG Team Assistance

- ✓ Provide Background information to customers on CNG
 - Introduction, resource links, and case studies
- ✓ Provide gas availability at location(s)
- ✓ Introduce options for both Station and Vehicle conversion
- ✓ Provide contacts for 3rd party companies to quote stations and vehicle
- ✓ Introduce to other parties who use CNG
 - PECO or other current CNG customers
- ✓ Help connect to grant writing and distributing through Clean Cities

CNG Proposed Incentives

✓ PECO

- Station commitments can negate cost for service lines

✓ Non-PECO Incentives*:

•PA Marcellus Shale (approved and passed):

- \$20 million over 3 years
- 50% funding up to \$25k per vehicle
- 50% for transportation services

•PA Alternative Fuel Incentive Grant - AFIG (approved and passed)

•Federal NatGas Act (not passed):

- All Fuel incentives and vehicle incentives expired Dec. 31st, 2011
- Several versions have been put forward

•President Obama Budget (not passed):

- Extend alt fuel tax credit for all fuel sales
- Provide Vehicle incentives



An Exelon Company

Questions?

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