



**City of Richmond  
DPW CNG Project**

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# CITY OF RICHMOND – DPW COMPRESSED NATURAL GAS (CNG) REFUSE TRUCK FLEET

- ❑ **The City of Richmond Adopted the US Mayors Climate Protection Agreement That Seeks to Reduce Global Warming From Green House Gases By 2030**
  - Accomplishing this objective initiated a conversation between the Department of Public Works And The Department of Public Utilities May – June 2009
  - The Department of Public Works – Is responsible for refuse collection
  - The Department of Public Utilities Distributes Natural Gas to over 150,000 residents

# DPU NATURAL GAS SERVICE AREAS



# CITY OF RICHMOND – DPW COMPRESSED NATURAL GAS (CNG) REFUSE TRUCK FLEET

- ❑ **DPW & DPU conducted a CNG project feasibility study in March 2010 to replace 37 refuse trucks and build a CNG fueling facility**
- ❑ **We Evaluated:**
  - Vehicles & fuel consumption
  - Type & Capacity of infrastructure
  - Diesel Fuel Costs vs. CNG
  - Supply Consideration
  - Operating Expenses
  - Government Incentives
  - Environmental

# CNG FUEL SUPPLY CONSIDERATION

- Diesel ( $C_{12}H_{23}$ ) fueled vehicles are some of the highest producing greenhouse gas sources plus diesel is largely imported from countries that aren't necessarily our friends
- Natural gas ( $CH_4$ ) by contrast produces significant less greenhouse gas and is largely U.S. produced, plus there is a **100 + years supply of proven gas reserve**
- City of Richmond Gas Utility has long term gas supply contracts for fuel produced in U.S.
- City of Richmond can hedge gas costs to ensure fuel costs meets budget

**American fuel = American jobs**

# TYPE & CAPACITY of CNG STATION

- Time fill vs. Fast fill with time fill station selected because:
  - All trucks parked at central location
  - Limited room for fast-fill dispenser staging line at site
  - Time fill station generally lower cost
  - High pressure gas unavailable (fast fill generally requires high pressure gas or costly compressor boosters)

## **Fuel consumption:**

- Refuse trucks (37) averaged 17 gallons of diesel each day
- DPW study indicated they could right-sized fleet and replaced all diesel fleet with 25 CNG trucks
- The CNG trucks were estimated to use approximately 22 diesel gallons equivalent (DGE) each day



# DPW CNG OPERATION

## Fuel Production (2011 – 2013)

Diesel displaced = 252,853 galls @

\$3.21/gal = \$811,659 (28 months)

Compression and O&M = \$1.29 DGE

City Net to Payback = \$811,659 – 326,180

= \$485,479 or \$17,338/mo since 2011

**Not included: \$0.56 per DGE DOE Credit**



Natural Gas Delivery & Compression

## Tailpipe Emissions

23% less CO<sub>2</sub>

87% less soot

87 % less NO<sub>x</sub>

70% less CO

\* Increased methane emission offset  
by less CO<sub>2</sub> emission



Compressed Natural Gas Dispensing

# CNG VEHICLE MAINTENANCE & O&M

## Maintenance and Repair Costs

- So far the CNG trucks engine maintenance and repair costs are less than diesel (\*>\$1,400 per truck per month...old vs. new trucks not factored in)

## Fueling Station Power Cost

- Power cost - \$0.15 per DGE

## CNG Compression O&M

Contract \$0.30 to \$0.60 per DGE (depending on scope and volume)

## Noise

- 70% less noise vs. diesel

## Safety (safer vs. diesel or gasoline)

- Natural gas is lighter than air therefore dissipates
- Natural gas is non-toxic (diesel or gasoline is toxic and spills do contaminate soils)





# BENEFITS OF USING NATURAL GAS REFUSE TRUCKS

- ❑ **Natural Gas is a cleaner fuel vs. diesel or biodiesel**
  - **Less particulate matter – fewer Asthma attacks**
  - **Lower Levels of Nitrogen oxides – less smog**
  - **Less non-methane hydrocarbons emissions – Less toxins in the air**
  - **Noise (NY study): Reduction vs. diesel alongside the truck is 79.5 to 69.3 decibels Inside the cab 82.8 to 71.3**
  - **EPA estimate that occupational exposure to diesel increases the risk of lung cancer by 20 - 50%**

# BENEFITS OF USING NATURAL GAS REFUSE TRUCKS CONTD.

- ❑ Hydrogen fuel is the ultimate objective...It is completely sustainable and pollution-free. CNG is considered a Hydrogen bridge from which hydrogen can be made, also the Natural Gas fueling infrastructure can easily be converted to deliver hydrogen (Gas)
- ❑ So!

# WHY NATURAL GAS?

- Economics
- Emissions
- Energy Security
- Market Demand

On a Clear Day!

