



## The Transit Bus Niche Market For Alternative Fuels:

### ***Module 5: Overview of Propane (LPG) as a Transit Bus Fuel***

## **Clean Cities Coordinator Toolkit**

**Prepared by  
TIAX LLC, Irvine Office**

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## The Cummins Westport B LPG Plus is the “State-of-Art” LPG Bus Engine

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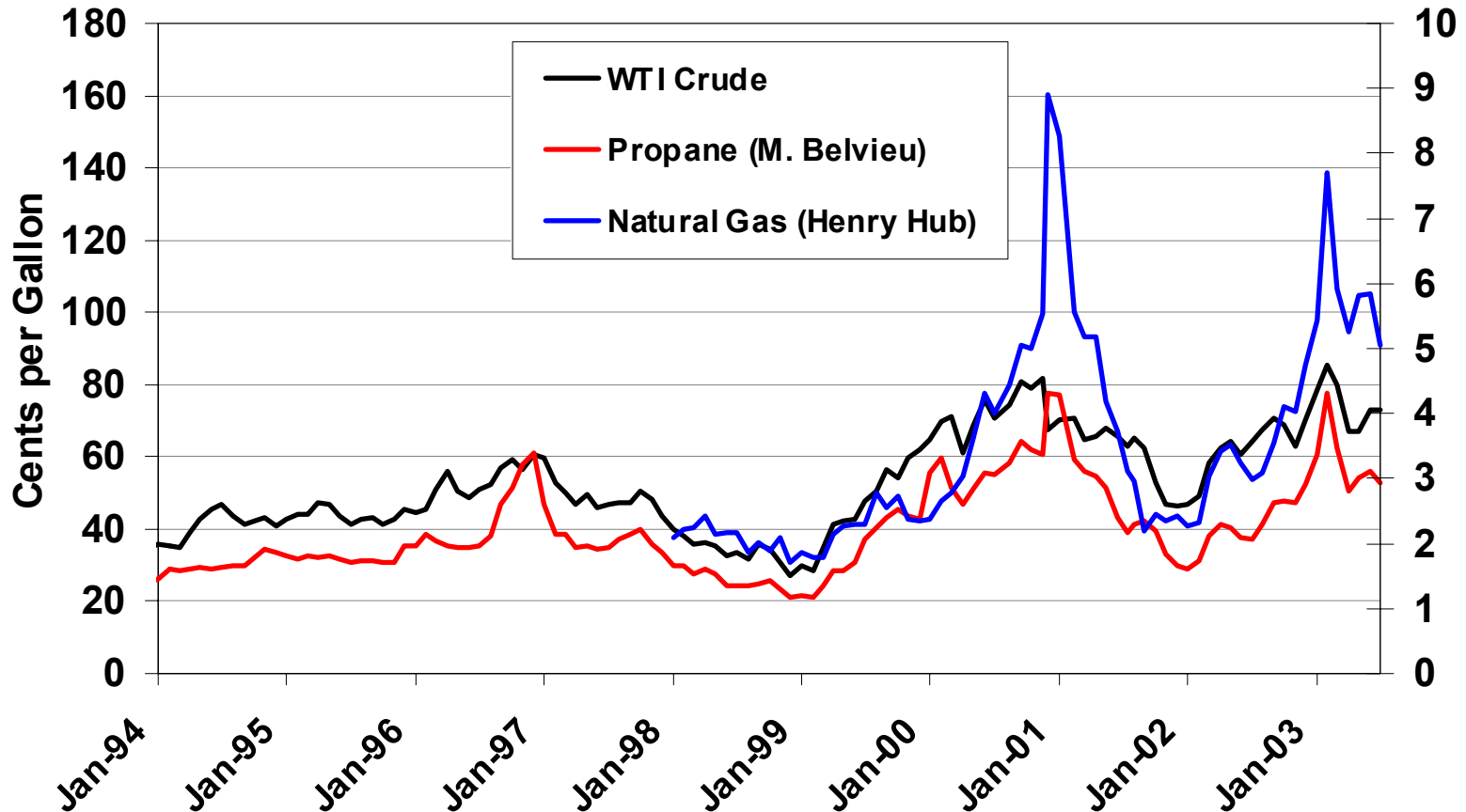
- Designed for 30 foot and smaller buses, including paratransit buses
- 195 HP / 460 lb-ft @ 1600 RPM
- Drive-by-wire technology, advanced electronic controls, improved sensors, knock detection and wider range fuel capability
- Uses closed loop, lean burn and oxidation catalyst
- Compatible with HD-10 or HD-5 propane spec.
- Easily meets 2004 U.S. and CARB standards for heavy-duty trucks and buses
- Up to 14 dBA quieter than diesel version of Cummins 5.9 engine



**Cummins Westport B LPG Plus  
Heavy Duty Engine**

# Propane Prices Generally Follow Crude Oil and Natural Gas Prices (EIA)

## Spot Prices



Source: DRI Platt's Spot Prices

Note: EIA did not define "Gallon" in this chart. Use this chart only to compare pricing trends.



## VIA Metropolitan Transit (San Antonio) LPG Transit Bus Operations

- Operates 67 Champion 30 ft Solo low floor LPG transit buses, 8 Chance 25 ft. LPG streetcars
- All powered by 195 hp Cummins B5.9 LPG engine certified to federal low-emission vehicle (LEV) standards
- About 46,000 miles / year / bus
- Also operates large LPG paratransit fleet
- Total of 3,106,208 annual miles on LPG



- Currently pumping 8,500 gallons of LPG per night
- Avg. fuel economy for Solo buses: 2.35 miles per LPG gallon
- = 3.56 miles per DGE
- Each bus has 3 on-board LPG storage tanks totaling 156 gallons of usable LPG
- Driving range: **nearly 350 miles**
- Recent LPG price: \$0.61 per gal (varies weekly)
- = to diesel at \$0.92 per gallon

## VIA Metro Transit's New LPG Fueling Station

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*New 30,000 gallon propane tank being installed at San Antonio VIA Transit*

- New state-of-art LPG station is being installed to replace original station
- Single 30,000 gallon propane tank (shown) is replacing two smaller tanks
- New setup will have 5 bays that dispense **LPG or diesel**, and 5 bays that dispense **diesel only**
- Cost of the bulk tank and 5 propane-dispensing bays: **\$114,790**

## What Path Brought VIA Metro Transit to Deploy Propane Transit Buses?


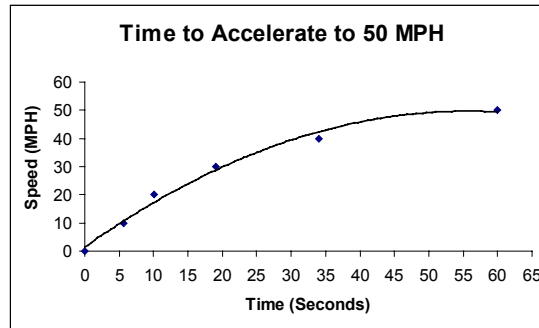
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- San Antonio is a “Propane City” that has powered refuse haulers and other vehicles on LPG for several decades
- In early 1990s, VIA Metro decided to investigate LPG due to emissions benefits and relatively low infrastructure costs
- Board directed purchase of LPG buses, if within 10% of diesel (life-cycle costs)
- VIA Metro used FuelCost 1.0 (Transportation Cooperative Research Program Report 38) as method to analyze life-cycle costs
  - MS Excel program developed in 1998 by TIAX’s California offices (known as ARCADIS Geraghty & Miller, at the time)
  - VIA Metro customized the program by changing defaults to its own data
  - **NOTE: TIAX updated this program for use by Coordinators (Module 9b)**
- Board approved large LPG fleet when VIA Metro estimated that Champion Solo LPG buses would cost only 8% more on a lifecycle basis than diesel (including amortized infrastructure costs)
- Associated emissions benefits estimated to be very significant
- Today VIA Metro requests quotes from vendors on both diesel and LPG buses, then uses FuelCost 1.0 to determine comparative economics



# Example of a Recent Procurement for LPG Buses

- City of Brownsville, Texas
- Up to four 30-foot low-floor transit buses
- Document length: 184 pages



**Request for Proposals**  
**for the Procurement of Two to Four (2-4)**  
**30-Foot, Low Floor Propane Transit Buses**  
**for the Brownsville Urban System**  
**(B.U.S.) Department**

**R.F.P. # AFB-29-0203**

Pre-Proposal Meeting Date: March 5, 2003  
Pre-Proposal Meeting Time: 10:00 a.m.  
At the Purchasing Conference Room

R.F.P. DUE DATE: March 19, 2003  
DUE TIME: 2:00 P.M.

## Propane Bus Specification

- Top speed: 65 mph with all accessories operating
- Gradability: 40 mph on 2.5% grade and 7 mph on 13% grade
- Range: 200 to 250 miles per fueling
- Engine durability: 300,000 miles w/o major failure or deterioration
- **Status:** three 30-foot propane transit coaches ordered @~\$265,000 per bus, with delivery in February 2004
- Funding: FTA grant administered by Texas DOT

## Other Current and Planned Users of LPG in Transit Applications Include:

- **Ontario (CA)** will replace older, LPG-powered buses currently in service with buses powered by the new B LPG Plus engine
- **Knoxville Area Transit (KAT)**
  - Already has 5 propane buses
  - Expects to add 15 more
  - Becoming a leader among Tennessee transit agencies using alternative fuels
- **Sevierville (TN) Mass Transit** expects to purchase 5 propane buses
- **Los Angeles Department of Transportation** using hybrid electric buses powered by propane-fueled Capstone microturbines (see Advanced Technology Module)
- **Various transit agencies** use propane in support and paratransit vehicles



## **Summary: LPG makes an excellent fuel for smaller buses and paratransit**

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- LPG currently has a very small (but increasing?) share of the transit market
- Use of LPG in the Cummins-Westport B LPG Plus engine provides very low emissions compared to its conventional diesel counterpart
- Transit agencies such as VIA Metro in San Antonio are making LPG work very effectively, and at life-cycle costs within 10% of diesel
- LPG fueling stations cost more than diesel, but significantly less than CNG and LNG stations
- The biggest barrier to using LPG as a major transit fuel in larger (40 ft.) buses is the lack of suitable, commercially available heavy-duty engines
- Operational issues associated with using LPG in transit (e.g., range and fuel efficiency) are generally less challenging than CNG or LNG
- Life-cycle costs for LPG buses appear to be decreasing, while life-cycle costs for diesel buses are likely to increase
- Strong training programs are essential (internal, or from the outside)
- Valuable support exists for Clean City Coordinators to work with transit agencies (see Module 11 for lists of resources)
- LPG buses are “bridge technology” to advanced hybrids (see Module 8)