Propane Education & Research Council

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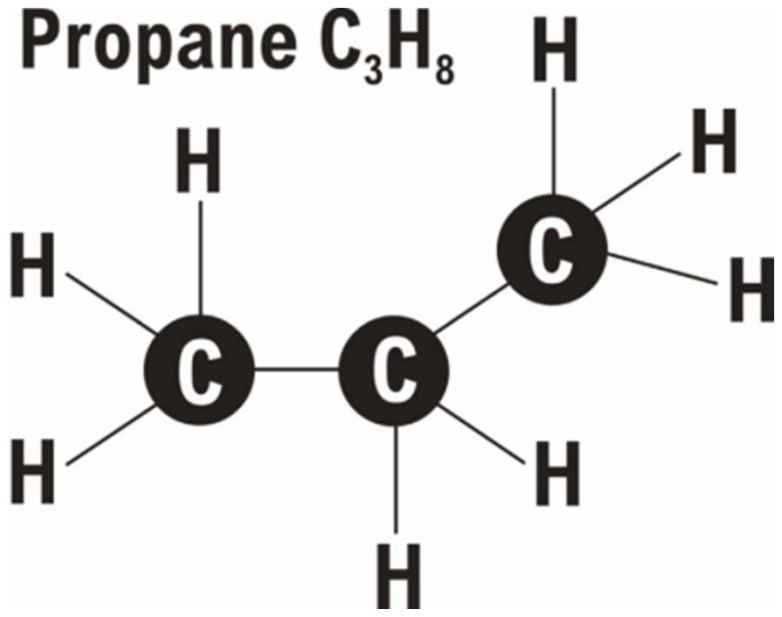
Consultant

Propane Education & Research Council

TOPICS

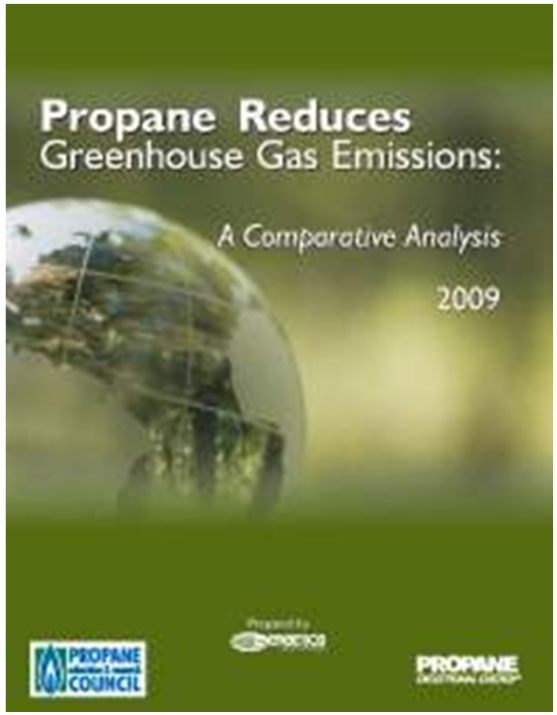
- Propane Industry
  - » Structure
  - » History
  - » Production
  - » Why Propane?
- Products and Solutions
- Fueling
- Case Studies
- Commercialization



Propane is considered a low carbon fuel.

NOTES ON METHODOLOGY

- Considers both upstream and end-use emissions ("well to wheels" analysis)
- Defines base case on which all comparisons are made
- All greenhouse gas emissions converted to CO_2 equivalent basis
- Normalizes results to propane (i.e., propane = 1.0) to facilitate comparisons
- GREET model v1.8c used for upstream emissions
- All figures presented on higher heating value basis



Acknowledgment: This material is based upon work supported by the Department of Energy under Award Number DE-EE0001711.

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PROPANE INDUSTRY

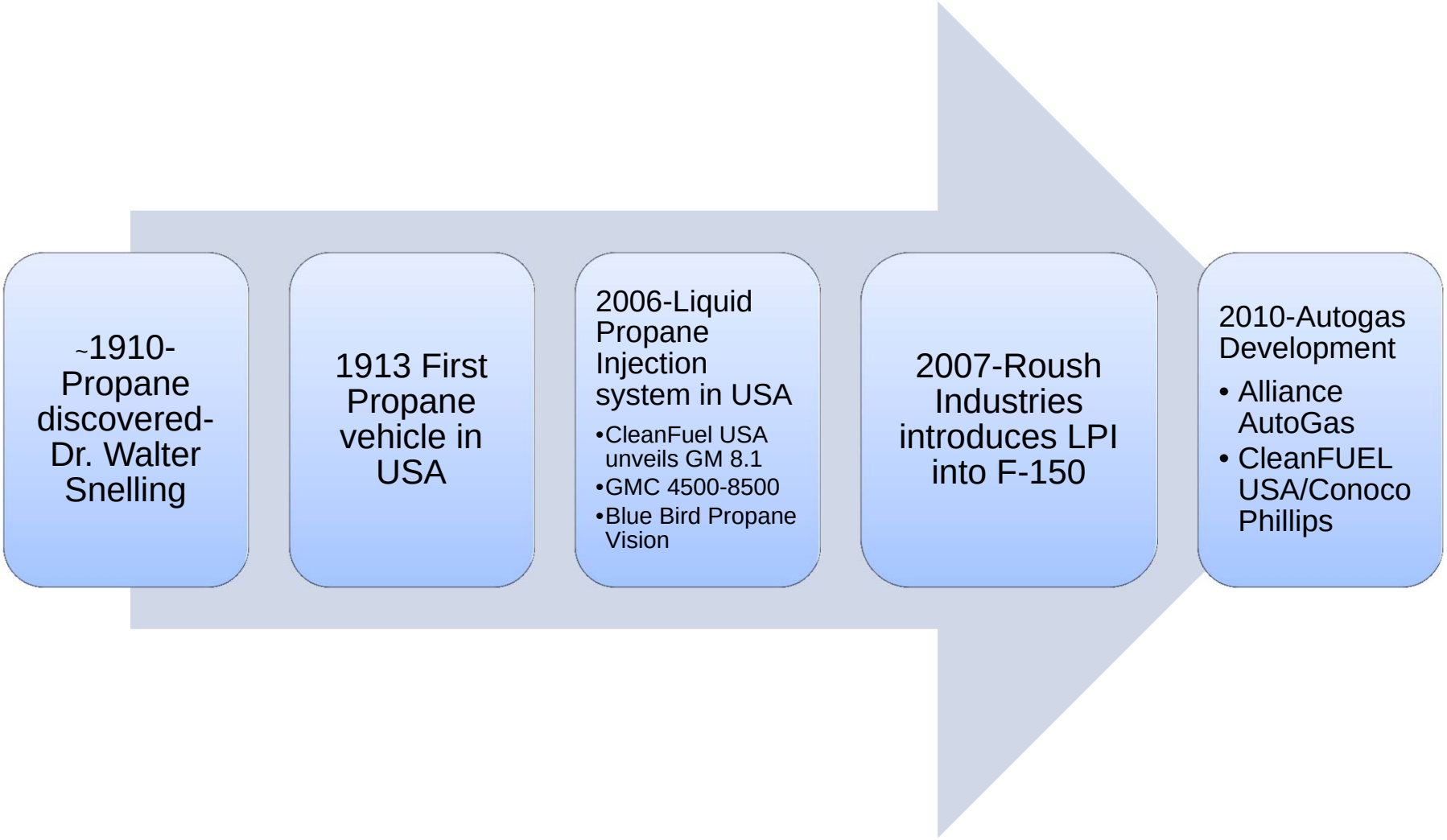
Propane Education and Research Council

PERC Promotes safe, efficient use of odorized propane through investments in research, safety and consumer initiatives (created 1998)

National Propane Gas Association

Membership is comprised of small businesses and large corporations engaged in all segments of the industry from retail marketing and appliances to manufacturers of equipment

HISTORY


~1910- Propane discovered- Dr. Walter Snelling
1913 First Propane vehicle in USA
2006-Liquid Propane Injection system in USA
•CleanFuel USA unveils GM 8.1
•GMC 4500-8500
•Blue Bird Propane Vision
2007-Roush Industries introduces LPI into F-150
2010-Autogas Development
• Alliance AutoGas
• CleanFUEL USA/Conoco Phillips

PRODUCTION

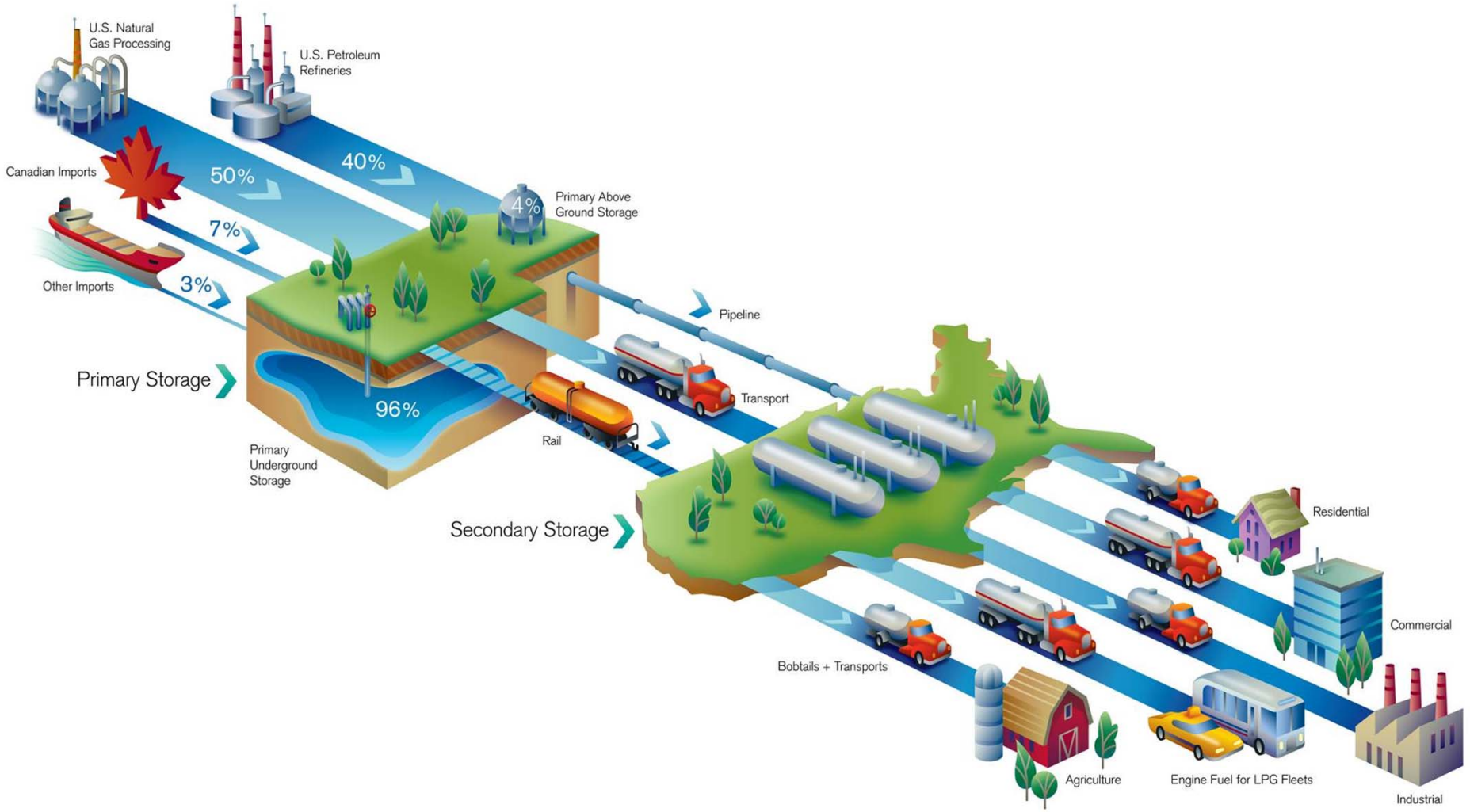
50 percent of the propane used in the USA comes from raw natural gas. (Raw natural gas is about 90 percent methane, 5 percent propane and 5 percent other gases.)

40 percent comes from petroleum during the refining process. (Propane vapors separated from gasoline liquid.)

7 percent from Canada/3 percent imported

Overall: 55 percent from natural gas

PROPANE SUPPLY & DISTRIBUTION



PROPANE AS AN ALTERNATIVE MOTOR FUEL

- ~270,000 propane vehicles in USA
- ~15M propane vehicles worldwide
- Referred to as “Autogas”
- Move in USA to use AutoGas for propane used for vehicle fuel

WHY PROPANE?

- Economical
  - Cost effective (maintenance & fuel cost)
  - Refueling is the least expensive option
  - Federal and state incentives
- Clean
  - Reduces CO2 emissions by up to 12 percent
    - NOx by up to 20 percent
    - CO by up to 60 percent
  - Overall reduces greenhouse gas emissions by up to 17 percent
- Safe
  - Low pressure fuel (100 psig-300 psig)
  - Narrow ignition range (2.15%-9.60%)

WHY PROPANE?

- Easy to use
  - Performance is identical to gasoline
  - Fast and easy re-fueling
- Available
  - Wide distribution network in every state
  - Propane marketer partners can assist with refueling options and costs
- Domestically produced
  - 90% is produced in the USA, 7 percent in Canada
  - Increases energy security and independence

PRODUCTS AND SOLUTIONS

PROPANE education & research COUNCIL

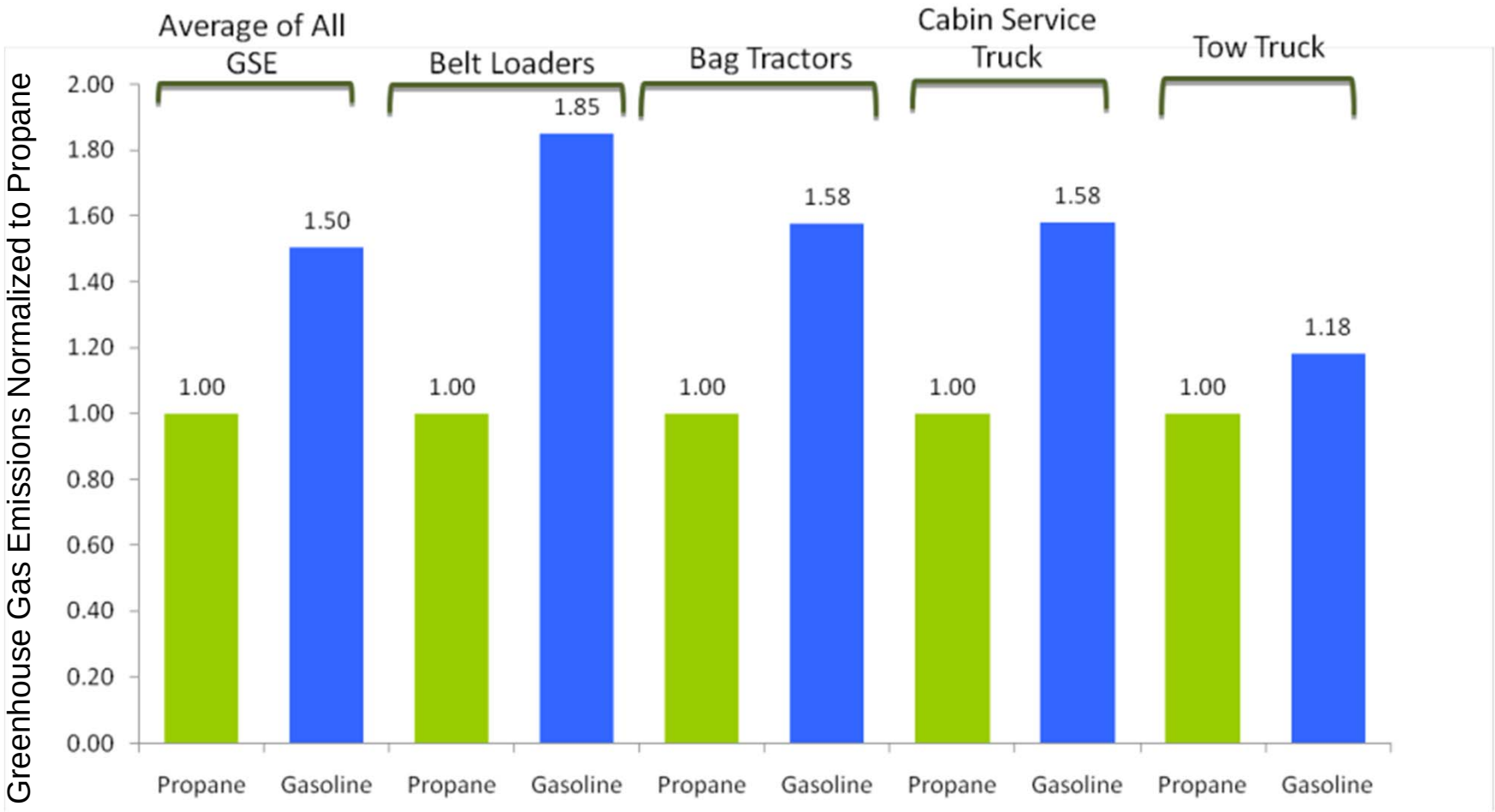
PROPANE-A TOTAL SOLUTION

PROPANE GSE PRODUCTS

TUG

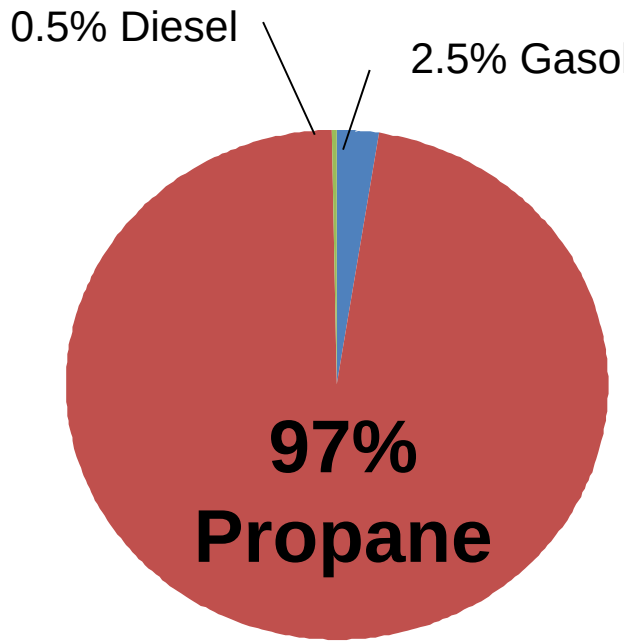

Works longer.
Costs less to maintain.
Refuels easily.
Burns cleanly.
Provides federal tax credit.
Propane-powered airport tugs.
A 50¢-per-gallon tax credit
plus a soft spot for the environment.

GROUND SERVICE EQUIPMENT



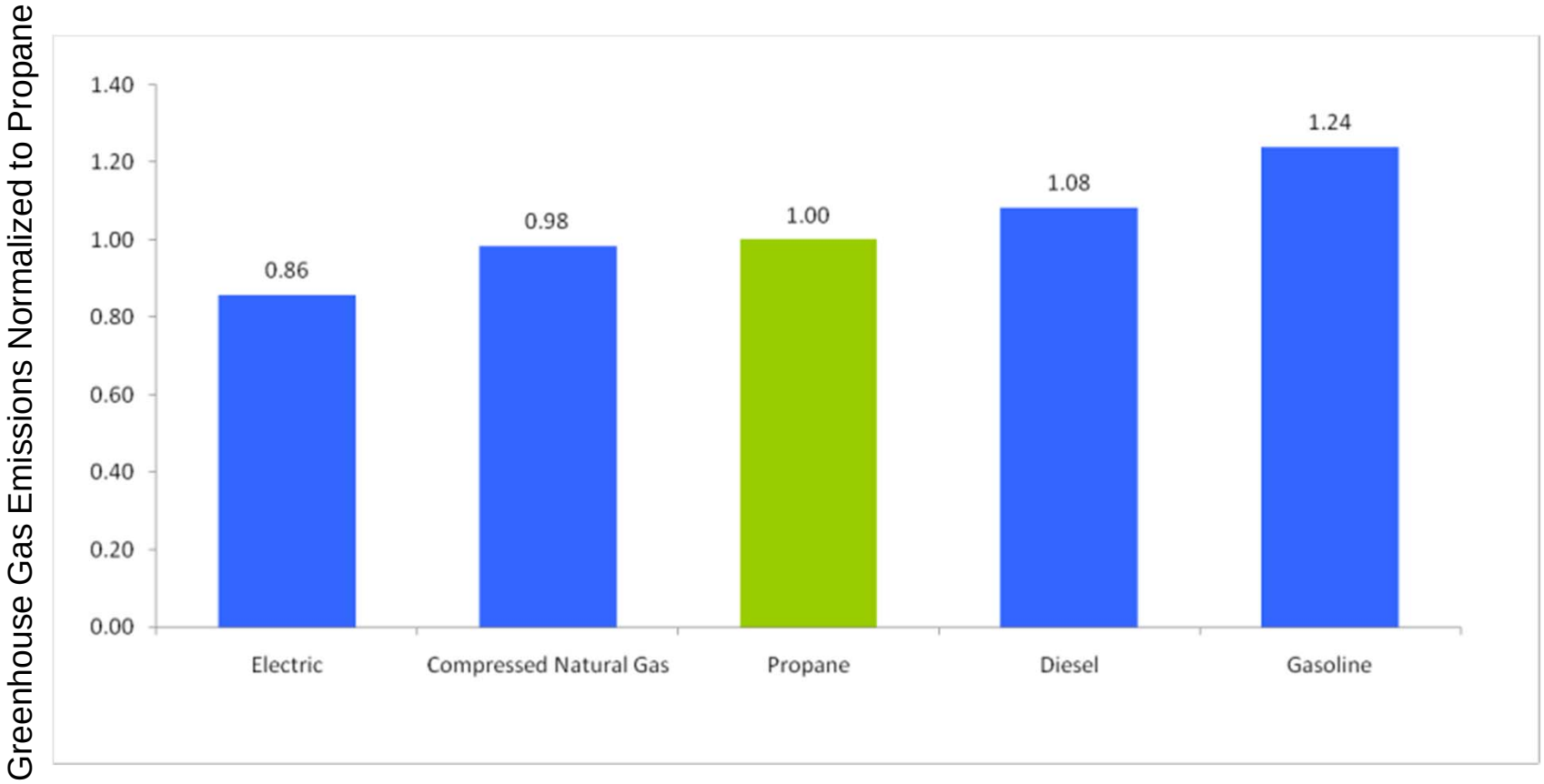
PROPANE FORKLIFTS

CLASS 4 CUSHION IC MARKET BREAKDOWN BY FUEL TYPE



- **Propane is Clean**
- **Propane is safe**
- **Propane tank exchanging is quick and simple**
- **Propane can extend life of the engine**
- **Propane can reduce lifetime maintenance costs**

FORKLIFTS


Greenhouse Gas Emissions Normalized to Propane
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.86
0.98
1.00
1.08
1.24
Electric
Compressed Natural Gas
Propane
Diesel
Gasoline

COMMERCIAL MOWERS

COMMERCIAL MOWERS

PROPANE COMMERCIAL MOWING OEMs

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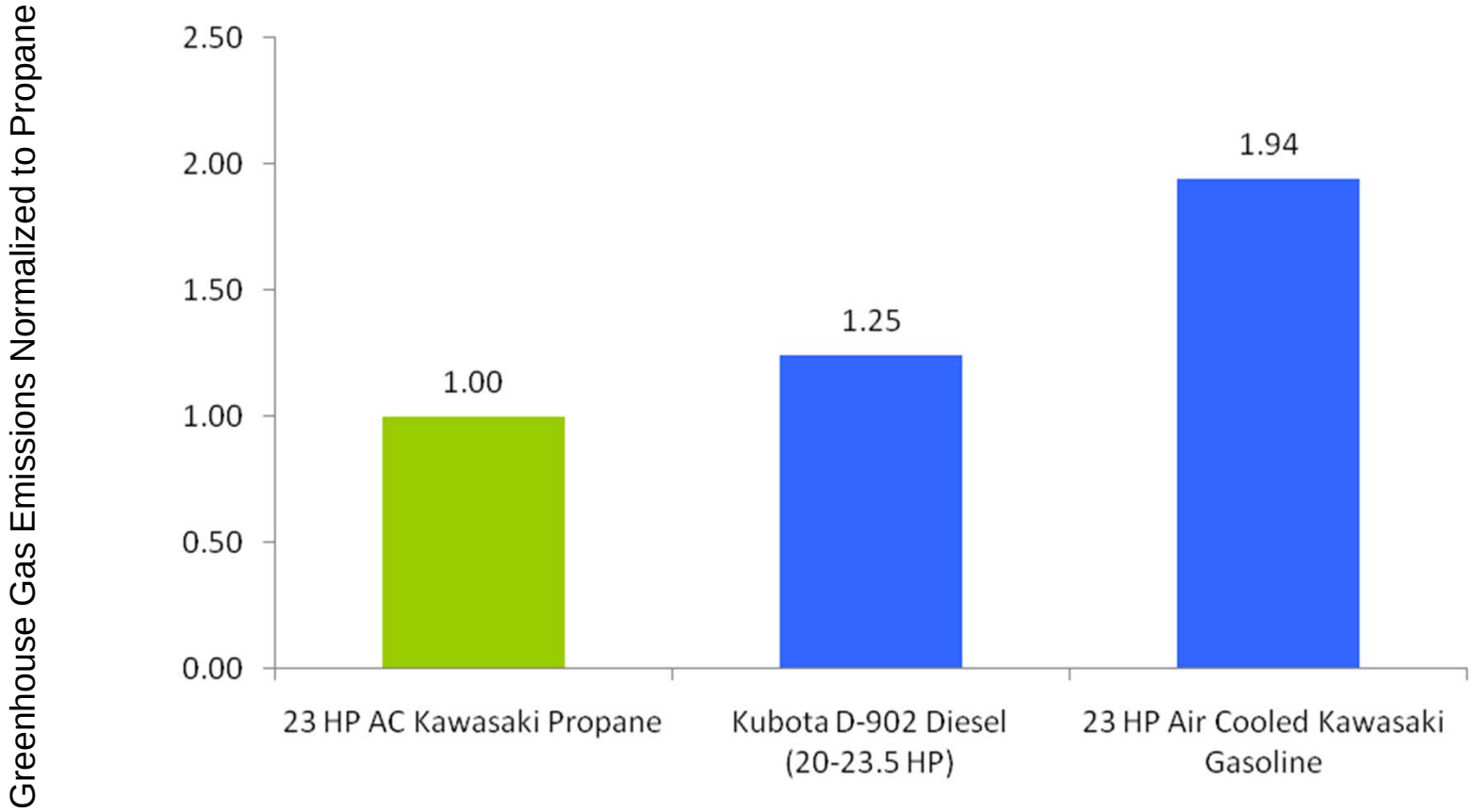
PROPANE MOWER ADVANTAGES

- Briggs & Stratton BIG BLOCK™ 32 HP Propane engine delivers a minimum of 30% lower harmful emissions.
- Not a converted gas engine.
- Engine has been EPA and CARB certified.

COMMERCIAL MOWERS



PROPANE TRIMMER

LEHR Eco Trimmer

Simply twist in the propane canister and start your trimmer— No messy mixing or gasoline storage required.

PROPANE—The LEHR Advantage

- **MORE RELIABLE**
  - No messy mixing of oil and gas
  - Easy start – no choke or priming
  - No winterizing – no carburetor gumming
- **MORE EFFICIENT**
  - 2 ½ hour run time on just one canister
  - Lower fuel cost
  - Lower maintenance cost
- **EASIER AND SAFER TO PURCHASE AND STORE**
  - Non-Toxic to ground water and soil
  - Canisters are readily available
- **ENVIRONMENTALLY FRIENDLY**
  - Zero evaporative emissions
  - Zero ozone depleting hydrocarbons
  - 99% fewer particulates
  - 96% fewer carcinogens
  - Exceeds 2011 EPA emissions standards
- **REDUCES DEPENDENCY ON FOREIGN OIL**
  - Over 85% of propane produced domestically

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LEHR ECO SERIES

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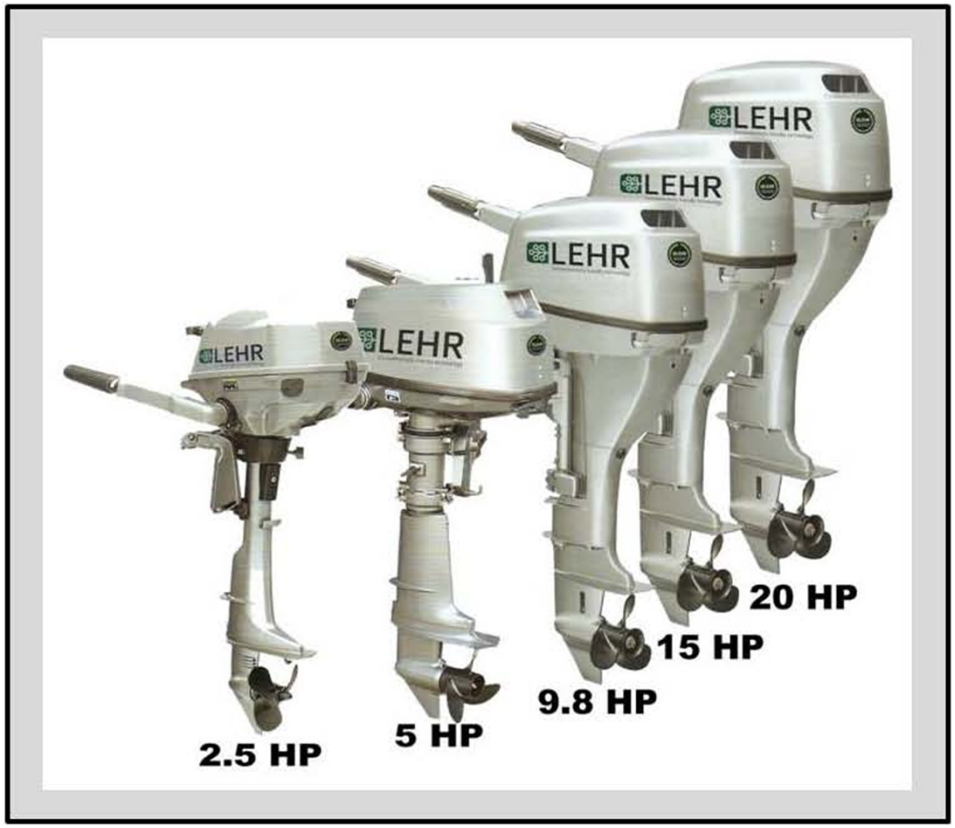
LEHR®

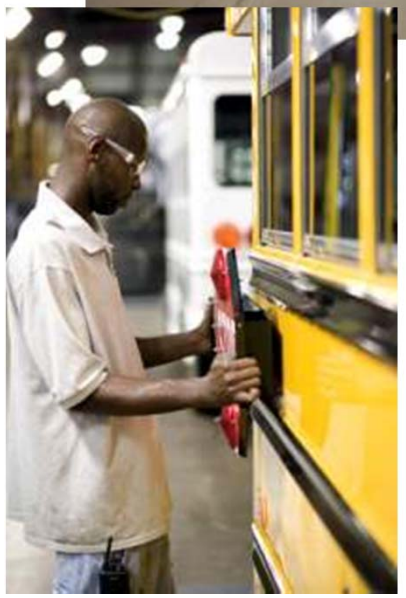
Environmentally friendly technology



PROPANE SCHOOL BUSES

COLLINS BUS CORPORATION

- LOCATED IN HUTCHINSON, KS
- FOUNDED IN 1966
- LARGEST TYPE A SCHOOL BUS MANUFACTURER In NORTH AMERICA
- COLLINS BUS, MID-BUS, CORBEIL
- MANUFACTURE ON FORD & GM CUTAWAY CHASSIS
- SEATING FROM 9 to 35 PASSENGERS



COLLINS BUS CORPORATION

GM Cutaway Chassis

- 6.0L V8 Propane engine
- 12,300 & 14,200# GVW
- 139” or 159” Wheelbase
- 6 Speed automatic transmission w/od
- 145 Amp alternator
- 40.5 Gallon propane tank
- Estimated fuel range 300 miles

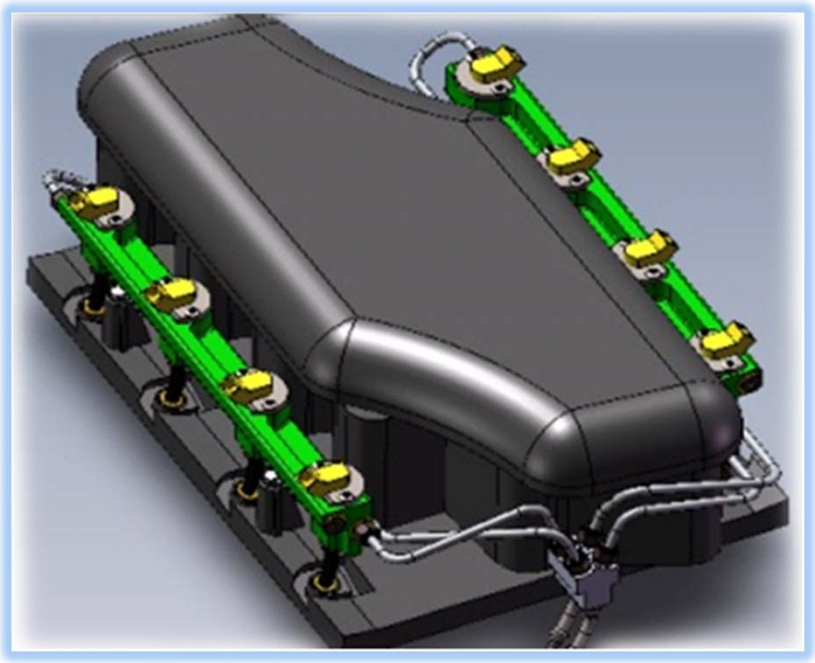
NEXBUS™ PROPANE

COLLINS BUS CORPORATION

The LPI System

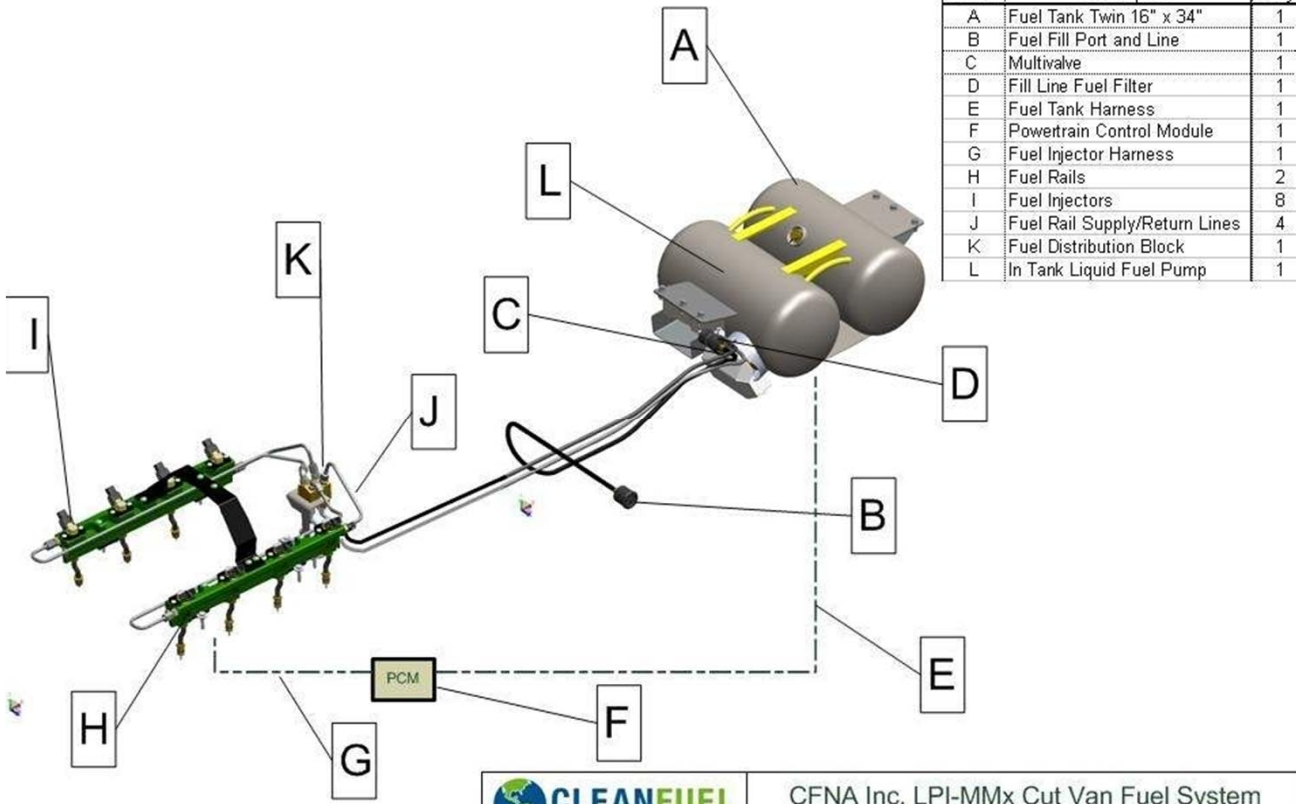
- GM 6.0L Propane Engine
- Liquid Injection System
- Clean-Low Emissions
- Simple Design
- Economical
- Superior Performance
- Safe
- Excellent Infrastructure

NEXBUS™ PROPANE



COLLINS BUS CORPORATION

NEXBUS™ PROPANE



Fuel System		
Callout	Description	Qty
A	Fuel Tank Twin 16" x 34"	1
B	Fuel Fill Port and Line	1
C	Multivalve	1
D	Fill Line Fuel Filter	1
E	Fuel Tank Harness	1
F	Powertrain Control Module	1
G	Fuel Injector Harness	1
H	Fuel Rails	2
I	Fuel Injectors	8
J	Fuel Rail Supply/Return Lines	4
K	Fuel Distribution Block	1
L	In Tank Liquid Fuel Pump	1

CLEANFUEL NORTH AMERICA
Product Development Center
46425 Peary Ct. Novi, MI 48377

CFNA Inc. LPI-MMx Cut Van Fuel System

COLLINS BUS CORPORATION

NEXBUS™ PROPANE

COLLINS BUS CORPORATION

NEXBUS™ PROPANE

Clean – Low Emissions

2010	NOx Only
EPA & CARB – Diesel Standard	0.2
EPA & CARB – Gasoline Standard	0.2
6.0L Propane Certification Level	0.154

- Certified with EPA & CARB at Zero Particulate Matter
- No need for DPF, Cooled EGR or SCR Systems

Company Overview

Girardin plant consists of 101,000 sq/ft (85,000 production and 16,000 office)

COUNT ON BLUE BIRD

AS THE LEADER OF AFFORDABLE GREEN SOLUTIONS

MICRO BIRD by GIRARDIN

BLUE BIRD MICRO BIRD

Ford E-450 Cutaway

Model Years: 2009 – 2011

Engine Size: 6.8L V10 (2V)

Applications: Dual Rear-Wheel Cutaway
5-Speed Auto Transmission

Tank Sizes: Under-Floor – 43 gallons

Ordering: Ford Ship Through
Conversion Kits

Timing: Q1, 2011

BLUE BIRD VISION TYPE-C SCHOOL BUS PROPANE-POWERED

BLUE BIRD PRODUCT DEVELOPMENT STRATEGY

- Utilize the highest volume Type-C school bus and successfully have it operate on propane instead of diesel
- Must remain designed and engineered to the same exacting standards and meet all Federal Motor Vehicle Safety Standards
- Become the lowest incremental cost alternative fuel powered large school bus

BLUE BIRD PRODUCT DEVELOPMENT STRATEGY

- The result: Only fully integrated and school purpose-built chassis OEM propane-powered large school bus

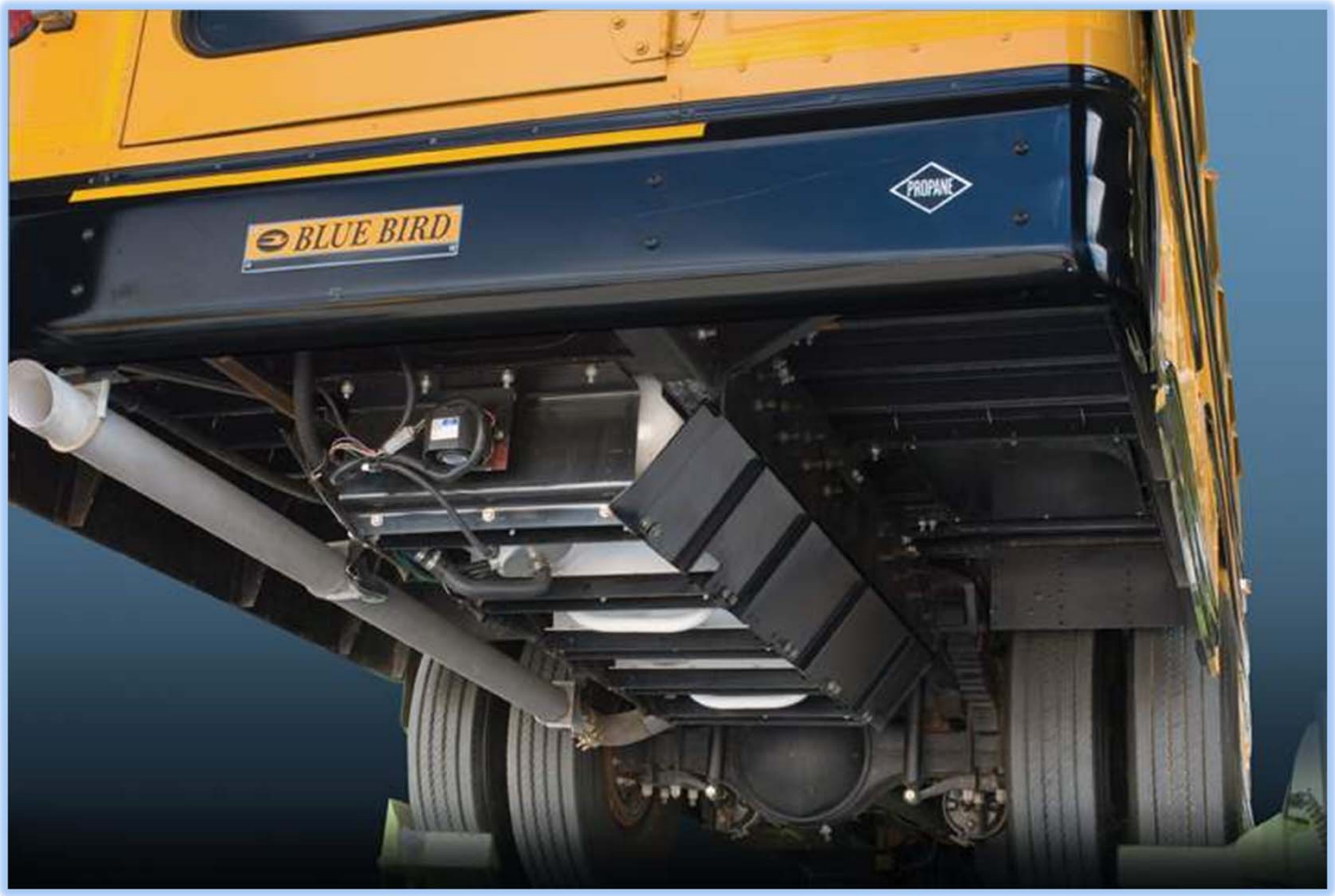
- Safe, Affordable Green Transportation
  - » Already the lowest cost alternative fuel powered large school bus with a $13,761 MSRP differential to 2009 Diesel buses, with 2010 diesel emission treatment added to buses this will be reduced further to more like a $7,500 premium.

SAFE

Crash Test

- 4,000 lbs @ 40 MPH
- Angled Side and Rear Impact
- 220 PSI Tank Pressure
- CMVSS 301.1 Protocol
- No Leakage or No Pressure
- Drop in 30 Minute Test

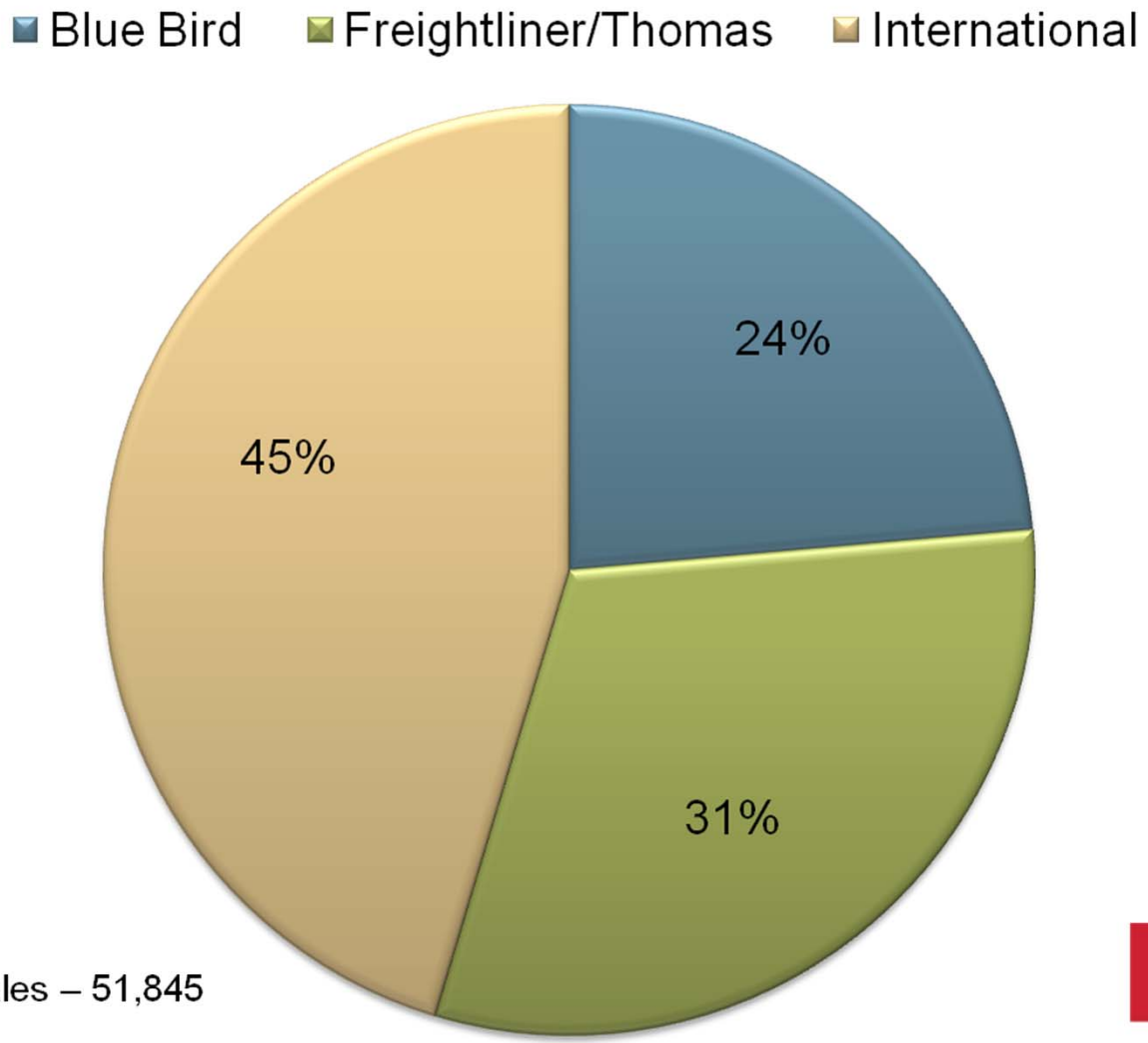
16 MOUNTING POINTS VS 4 LOCATED INSIDE CRASH CAGE



BLUE BIRD/ROUSH 6.8L 3V

- Capacities: 47-77 students
- Wheelbases: 189”-273”
- GVWR Up to 33,000 lb.
- Ford/ROUSH 6.8L 3V LPG Engine (V10)
- Low emission vehicle certification
- ROUSH providing engineering design, development, and testing support for the powertrain, vehicle, and other required systems integration

2008-2009 TYPE-C SCHOOL BUS SALES



Total 2008-2009 Sales – 51,845

8.0L LPG Engine Program Summary

- Freightliner Custom Chassis Corp., Powertrain Integration, and Clean Fuel North America are responsible to bring a propane-fueled school bus and bobtail to market
- The program is based on an 8.0L long block provided by GM, a control system provided by PI, and a propane fuel system provided by CFNA
- The engine assembly and fuel system will be certified for use in all 50 states and Canada in applications up to 33,000-lb GVWR

FREIGHTLINER PRODUCTS

CLEANFUEL USA/GM 6.0L CUTAWAY VAN C2500/3500 HD CHASSIS CAB AND TYPE A COLLINS SCHOOL BUS

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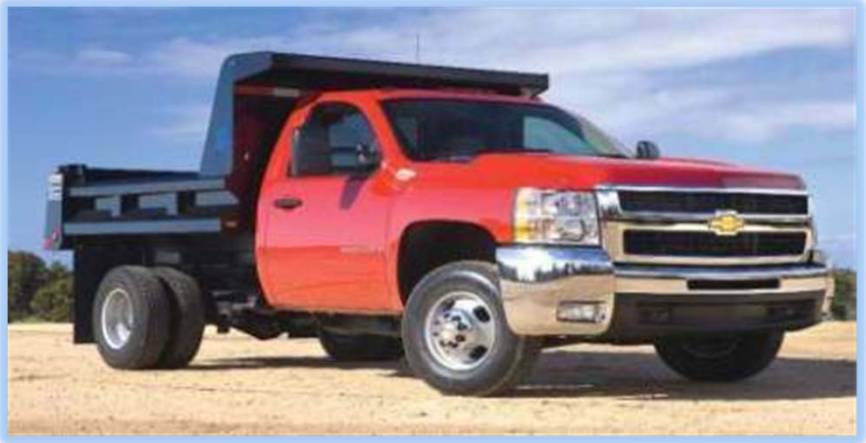
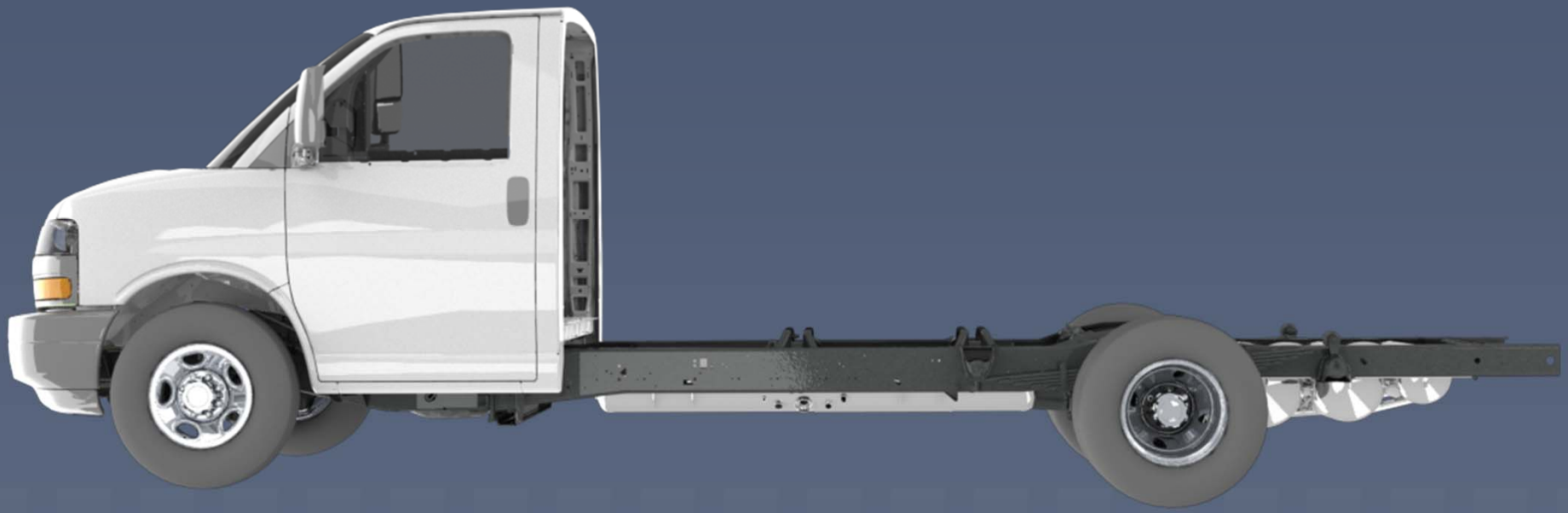


Integrated LPG Solution

- Hardened 6.0 L Vortec Engine
- Fully integrated LPG fuel storage / delivery system and installation process
- Engineered for the same reliability, durability and safety you would expect from all GM products
- Fully warranted by GM and serviced by Chevrolet and GMC dealers

LPG Van Offerings

159” Wheelbase Cutaway 33803

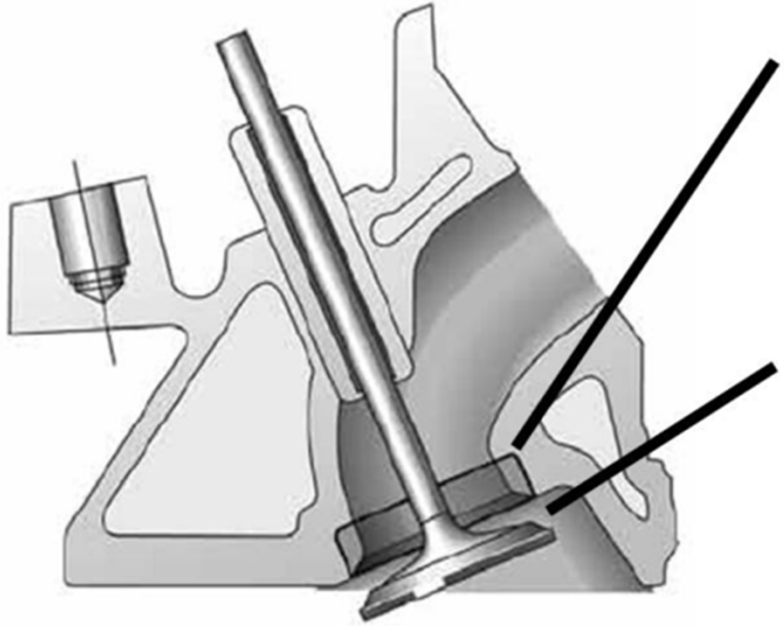


Shipment of our new LPG Express and Savana Cutaway is scheduled to begin in fourth quarter 2011

Proven 6.0 L Vortec Engine

The (LC8) 6.0L Vortec gaseous fuel ready engine has:

- Hardened exhaust valves
- Hardened intake and exhaust valve seats
- Full 5 year / 100,000 mile Powertrain Warranty

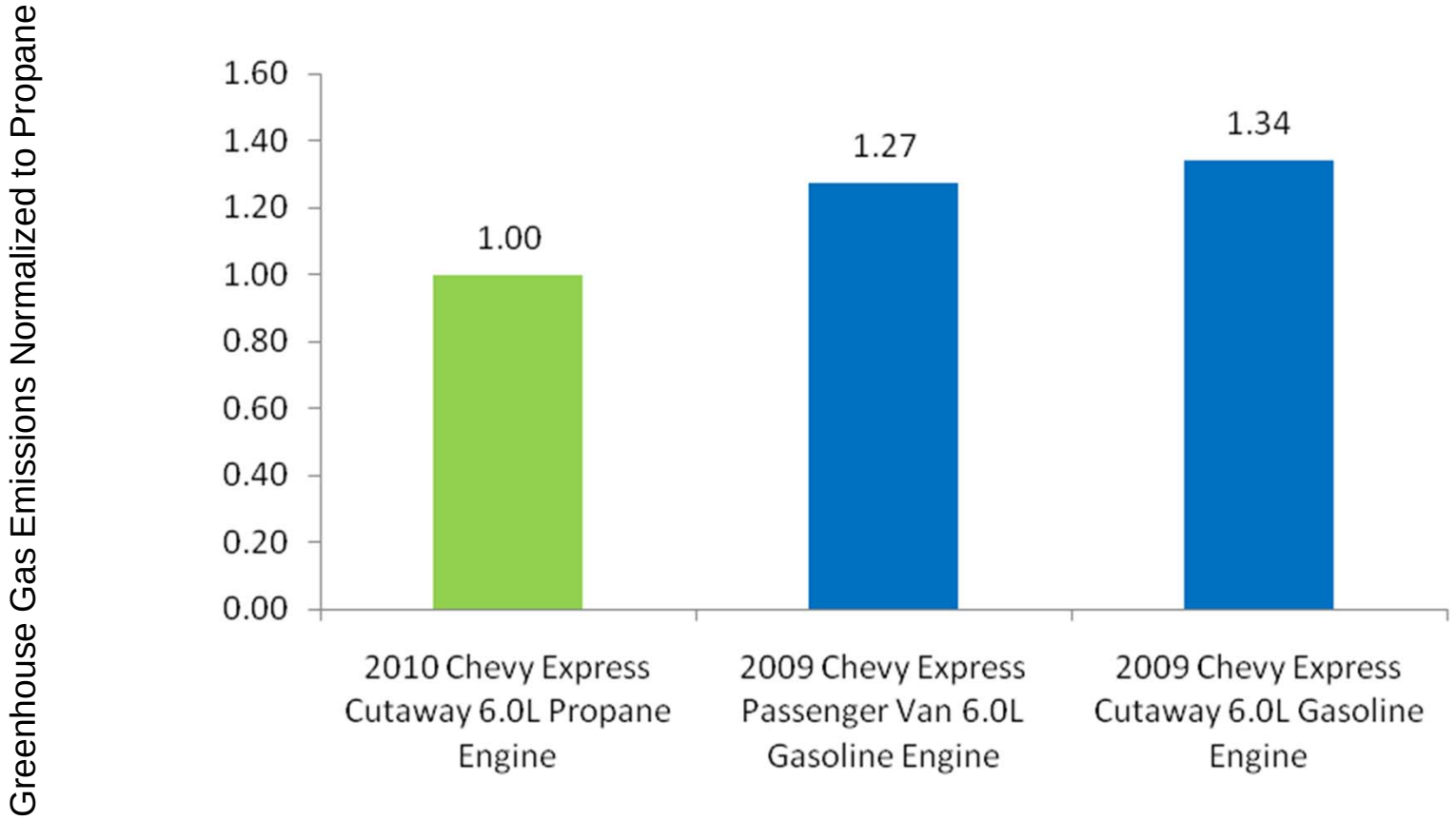


Exhaust valve seat inserts ensure an excellent seal between the valve and valve seat.

Exhaust valves made of special materials resist the higher temperatures and corrosive nature of propane and natural gas.

6.0L Engine

GM CLEANFUEL USA 6.0-LITER ENGINE



ROUSH CLEANTECH PRODUCTS PICKUPS

Ford F-250 / F-350

Model Years: 2009 – 2010

Engine Size: 5.4L V8 (3V)

Applications: All Bed Lengths
All Cab except Chassis Cab
All Axle configurations

Tank Sizes: In-Bed – 55 gallons
Under-Bed - 23 gallons

Ordering: Ford Ship Through
Conversion Kits

Certification: EPA
CARB

ROUSH CLEANTECH PRODUCTS VANS

Ford E-150 / E-250 / E-350

Model Years: 2009 – 2011

Engine Size: 5.4L V8 (2V)

Applications: All Cargo configurations
All Passenger configurations
Single Rear-Wheel Cutaway

Tank Sizes: Under-Floor – 25 gallons

Ordering: Ford Ship Through
Conversion Kits

Certification: EPA
CARB (pending)

ROUSH CLEANTECH PRODUCTS CUTAWAY VANS

Ford E-450 Cutaway

Model Years: 2009 – 2011

Engine Size: 6.8L V10 (2V)

Applications: Dual Rear-Wheel Cutaway
5-Speed Auto Transmission

Tank Sizes: Under-Floor – 43 gallons

Ordering: Ford Ship Through
Conversion Kits

Timing: September 2010

ROUSH CLEANTECH FUTURE PRODUCTS

Ford F-250 / F-350 (January, 2012)
- 6.2L V8 (3V)

Ford F-650 (April, 2012)
- 6.8L V10 (3V)

Ford F-59 / F-53 Strip Chassis
- 6.8L V10 (3V)

Ford Transit Connect
- TBD Powertrain

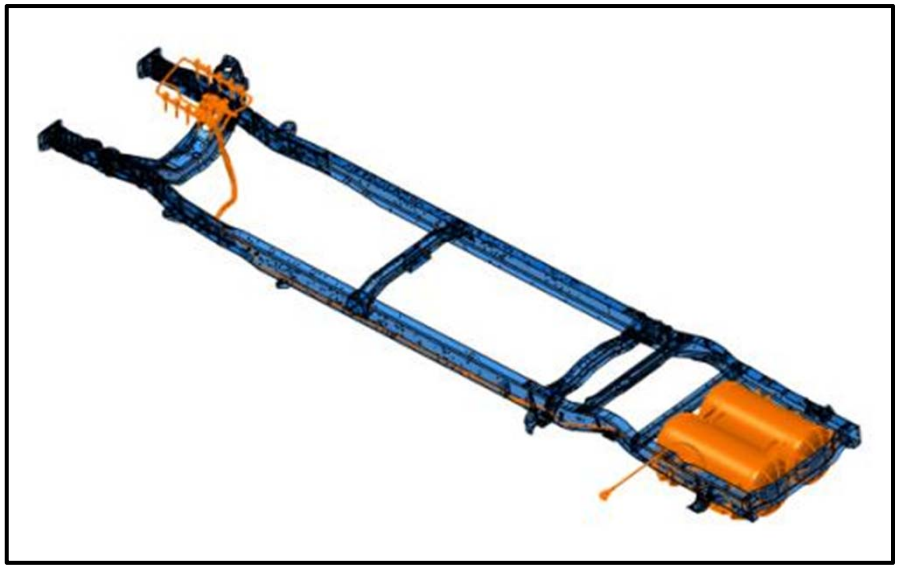
Ford F-150
- TBD Powertrain

SYSTEM OVERVIEW

Fuel Rail Assembly
- » Fuel Rails
- » Fuel Injectors
- » Injection Press. / Temp. Sensor

Fuel Line Assembly
- » Fuel Lines
- » Flow Control Solenoid

Fuel Tank Assembly
- » Fuel Tank
- » Fuel Pump
- » Fuel Level Sensor



2011 Ford E-450 DRW Cutaway Fuel System

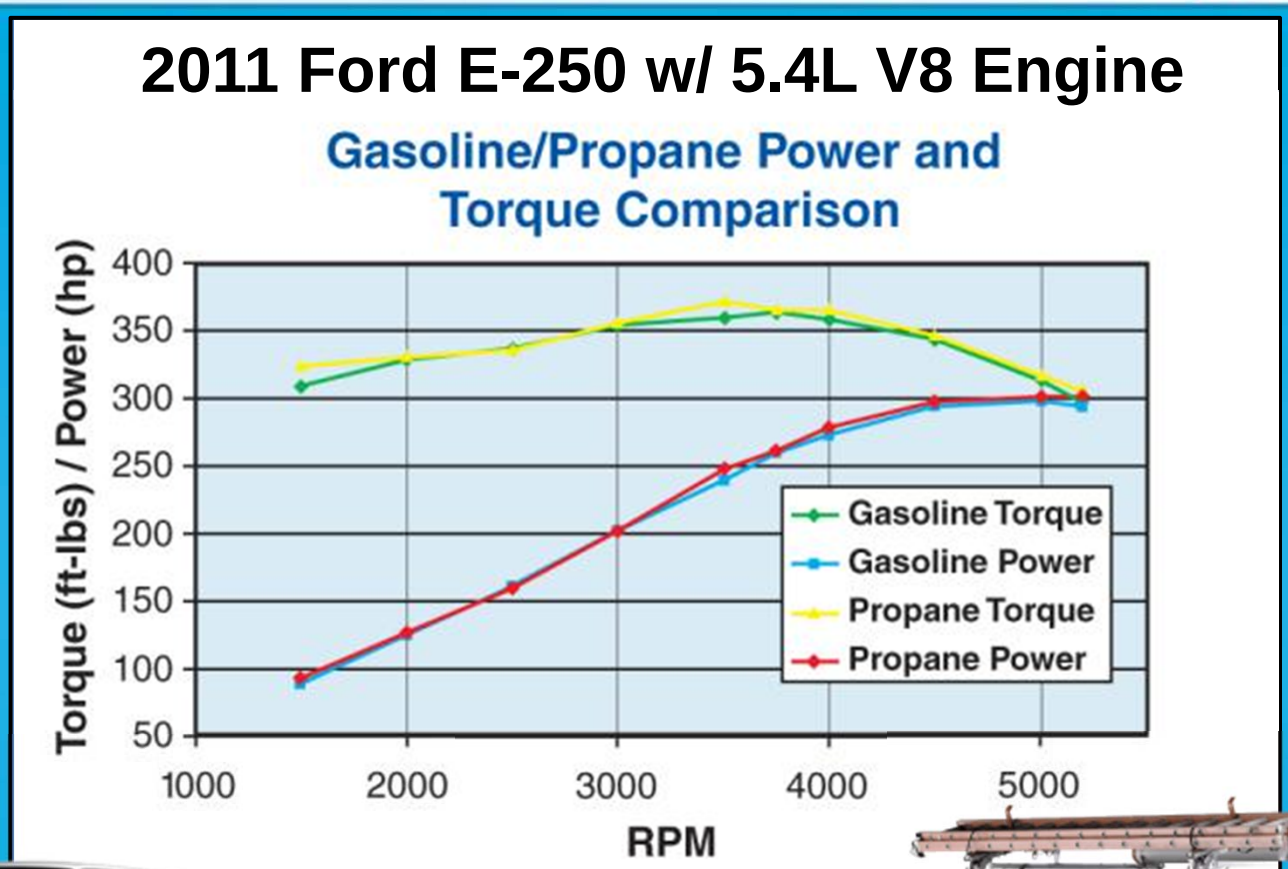
Powertrain Control System

- – PCM Calibration
- – Wiring Harness

Performance

ROUSH CLEANTECH

2011 Ford E-250 w/ 5.4L V8 Engine



800.59.ROUSH

ROUSHcleantech.com

Cold Weather Performance

ROUSH CLEANTECH

Alaska DOT Testing

- Chandalar
- Anchorage
- Fairbanks

Marketing & Awareness

ROUSH CLEANTECH

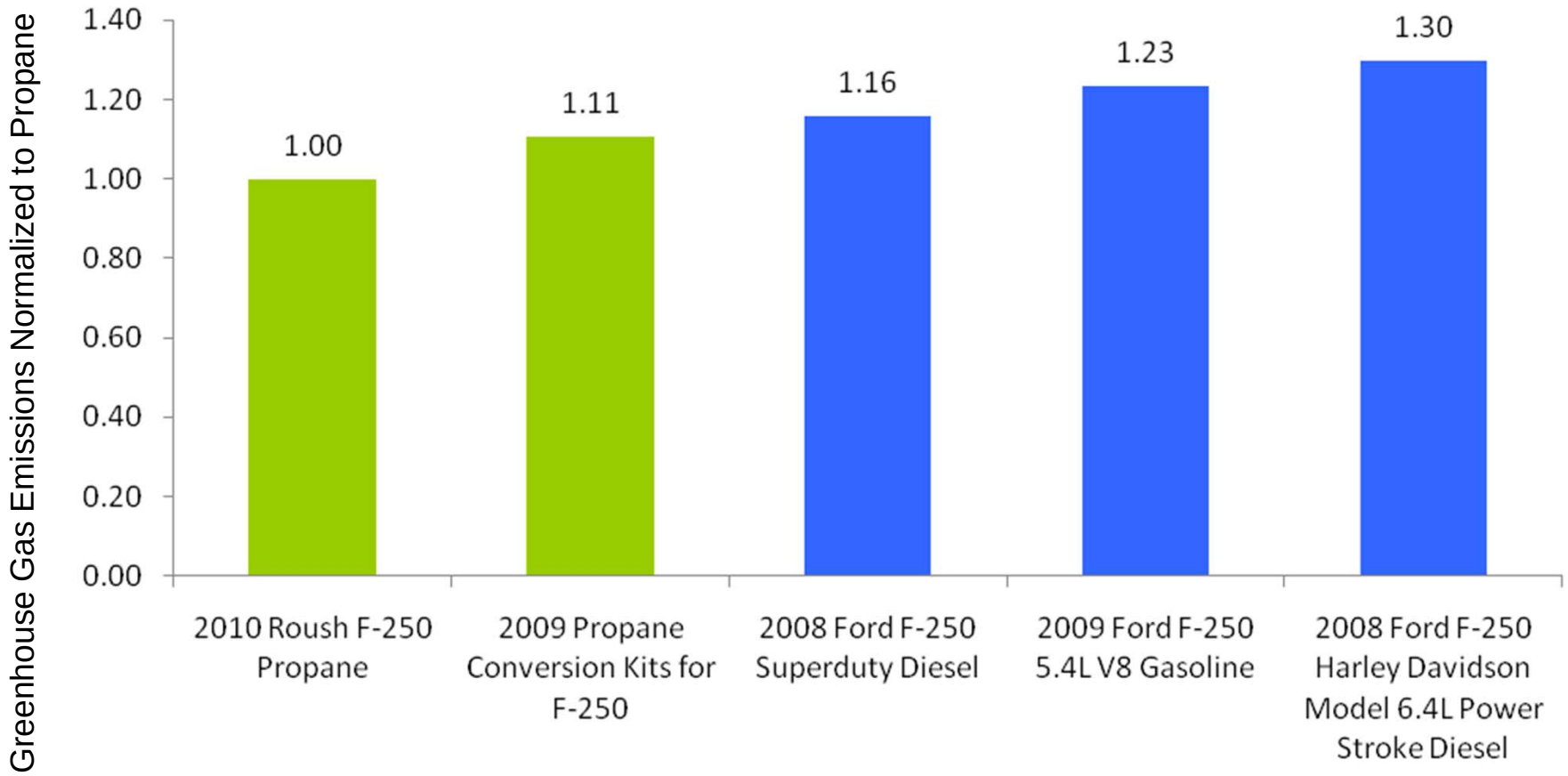
- Man Caves (DIY Network)
  - 26 Episodes
  - Vehicle at select Trade Shows

SERVICEABILITY

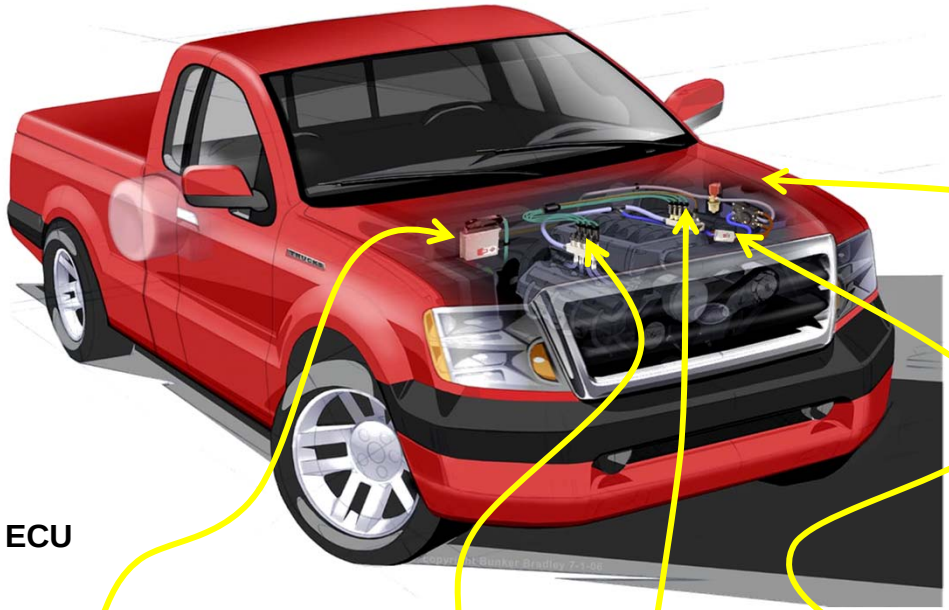
- **Serviceable at any Ford Dealership**
  - 3,500 Ford Dealerships Nation-Wide

- **Ford Factory Warranty Maintained**
  - 5 year / 60,000 mile Powertrain
  - 3 year / 36,000 mile Drivetrain

FORD F-250


Greenhouse Gas Emissions Normalized to Propane
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1.00
1.11
1.16
1.23
1.30
2010 Roush F-250 Propane
2009 Propane Conversion Kits for F-250
2008 Ford F-250 Superduty Diesel
2009 Ford F-250 5.4L V8 Gasoline
2008 Ford F-250 Harley Davidson Model 6.4L Power Stroke Diesel

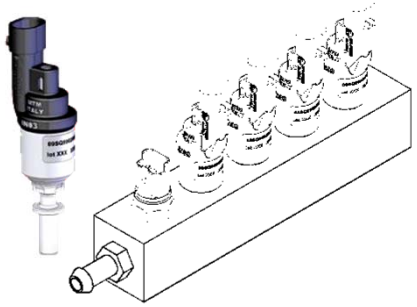
SEQUENTIAL SYSTEM



LPG Reducer

Gaseous ECU

Injector & Rail Assembly

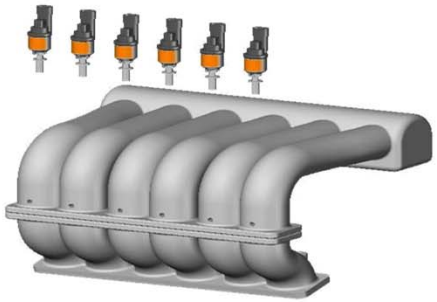


Vapor Filter (LPG)

FUEL CHANGEOVER

SPECIFICALLY DESIGNED FOR BI-FUEL APPLICATIONS

THE OEM INJECTORS ARE SHUT DOWN BY THE SEQUENT PLUG & DRIVE ECU



CONDITIONS THAT ALLOW CHANGEOVER:

- **Temperature**
  (engine coolant @ the alt fuel regulator)
- **Time After Engine Start**

Sequential Changeover

IMPCO AFTERMARKET PRODUCTS

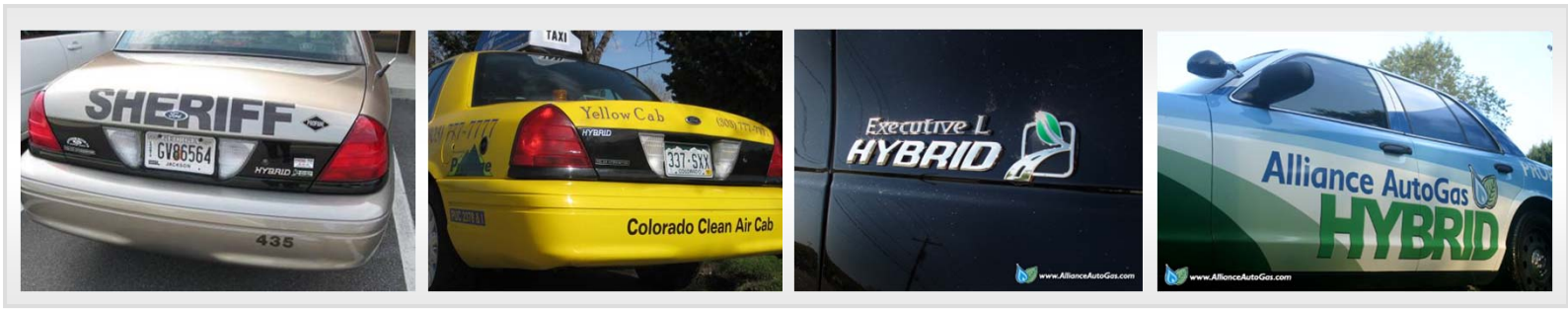
- **Summary of IMPCO EPA Certified Systems**
  - 3.5L Chevrolet Impala (2008/2009)
  - 4.8L Chevrolet G-Van (2008/2009)
  - 5.3L Chevrolet Avalanche (2009)
  - 5.3L Chevrolet Suburban (2009) (2009)
  - 5.3L GMC Yukon (2009)
  - 6.0L Chevrolet Silverado (2008/2009)
  - 6.0L Chevrolet G-Van (2008/2009)
  - 6.0L GMC Savana (2008/2009)
  - 3.9L Chevrolet Impala (2008/2009)
  - 4.8L GMC Savana (2008/2009)
  - 5.3L Chevrolet Silverado (2009)
  - 5.3L Chevrolet Tahoe
  - 5.3L GMC Sierra (2009)
  - 6.0L Chevrolet Express (2008/2009)
  - 6.0L GMC Sierra (2008/2009)
  - 5.4L Ford F150 (2007)

ALLIANCE AUTOGAS

Alliance AutoGas uses the Prins Vapor Sequential Injection System:

- Used widely in Europe and Asia
- Starts on gasoline, immediately switches to AutoGas
- Can switch back to gasoline if an AutoGas filling station cannot be reached.
- DOT-approved fuel tanks, multiple mounting options

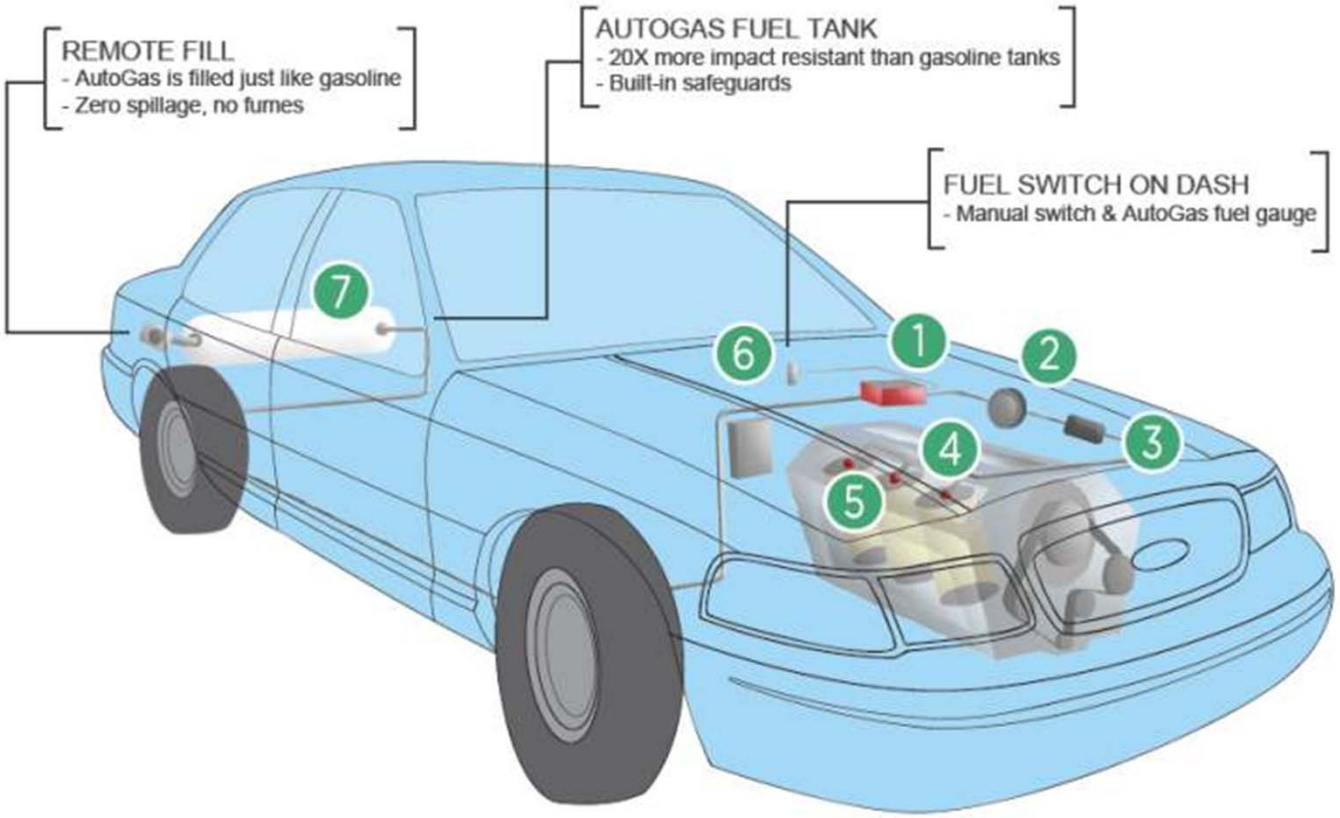
- Alliance AutoGas founding partner American Alternative Fuels (AAF) is the exclusive North American Distributor of the Prins System
- Alliance AutoGas Certified Conversion Technicians require just 10 man-hours, on average, to convert a vehicle from gasoline to propane AutoGas using the Prins VSI system



ALLIANCE AUTOGAS SYSTEMS

The AAF – Prins VSI System

(VSI = Vapor Sequential Injection)



1. VSI ECM
2. REDUCER
3. FILTER UNIT
4. INJECTOR RAIL
5. OEM INJECTOR
6. FUEL SELECTOR SWITCH
7. TANK

VEHICLES SUPPORTED

PROPANE education & research COUNCIL

AAF - PRINS SYSTEM EPA VEHICLE CERTIFICATIONS			
	MODEL YEAR(S)	MAKE	MODEL
FORD	2006, 2007, 2008, & 2009, **2010**	FORD	4.6L CROWN VICTORIA
	2006, 2007, 2008, & 2009, **2010**	FORD	4.6L CROWN VICTORIA POLICE PACKAGE
	2006, 2007, 2008, & 2009, **2010**	LINCOLN	4.6L TOWN CAR
	2006, 2007, 2008, & 2009, **2010**	MERCURY	4.6L GRAND MARQUIS
	2006, 2007, 2008, & 2009, **2010**	FORD	AIRPORT LIMO
	2006	FORD	5.4L F-150
	2007*, 2008*, **2009, 2010**	FORD	5.4L F-150
	2007*, 2008*, **2009, 2010**	FORD	4.6L F-150
	2007*, 2008*, **2009, 2010**	FORD	5.4L E-350
	2007*, 2008*, **2009, 2010**	FORD	4.6L E-350
	2007*, 2008*, **2009, 2010**	FORD	5.4L E-250
	2007*, 2008*, **2009, 2010**	FORD	4.6L E-250
	2007*, 2008*, **2009, 2010**	FORD	5.4L E-150
	2007*, 2008*, **2009, 2010**	FORD	4.6L E-150
	2007*, 2008*, **2009, 2010**	FORD	4.6L EXPLORER SPORT TRAC
	2007*, 2008*, **2009, 2010**	FORD	4.6L EXPLORER
	2007*, 2008*, **2009, 2010**	FORD	5.4L EXPEDITION
	2007*, 2008*, **2009, 2010**	LINCOLN	5.4L NAVIGATOR

Alliance AutoGas POWERED BY PROPANE

All current EPA Certifications are pending 2010 reissue
**Approved, waiting for physical certification document (can convert private fleets)*
Bold *indicates pending certification. Application has been submitted.*

VEHICLES SUPPORTED

PROPANE education & research COUNCIL

	AAF - PRINS SYSTEM EPA VEHICLE CERTIFICATIONS		
	MODEL YEAR(S)	MAKE	MODEL
GM	2006, 2007	GMC	6.0L C3500 SIERRA 2WD
GM	2006, 2007	GMC	6.0L K3500 SIERRA 4WD
GM	2006, 2007	GMC	6.0L C2500 SIERRA 2WD
GM	2006, 2007	GMC	6.0L K2500 SIERRA 4WD
GM	**2006, 2007**	GMC	5.3L C1500 SIERRA 2WD
GM	**2006, 2007**	GMC	5.3L K1500 SIERRA 4WD
GM	**2006, 2007**	GMC	5.3L CANYON
GM	**2006, 2007**	GMC	5.3L YUKON
GM	**2006, 2007**	GMC	5.3L YUKON XL
GM	2006, 2007	CHEVROLET	6.0L C3500 SILVERADO 2WD
GM	2006, 2007	CHEVROLET	6.0L K3500 SILVERADO 4WD
GM	2006, 2007	CHEVROLET	6.0L C2500 SILVERADO 2WD
GM	2006, 2007	CHEVROLET	6.0L K2500 SILVERADO 4WD
GM	**2006, 2007**	CHEVROLET	5.3L C1500 SILVERADO 2WD
GM	**2006, 2007**	CHEVROLET	5.3L K1500 SILVERADO 4WD
GM	**2006, 2007**	CHEVROLET	5.3L AVALANCHE
GM	**2006, 2007**	CHEVROLET	5.3L TAHOE
GM	**2006, 2007**	CHEVROLET	5.3L SUBURBAN
ALL	2006 →	N/A	6.8L *(engine certification, not vehicle specific)*
ALL	2006 →	N/A	8.1L *(engine certification, not vehicle specific)*

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FUELING

PROPANE education & research COUNCIL

PROPANE IS ECONOMICAL

- As an engine fuel it typically costs ~30-50 percent less than gasoline
- Pricing tends to be better in propane producing states like Texas and Louisiana
- Propane is ~ 106 octane
- Same HP and torque as gasoline vehicles

The Fine Print

- Propane is 91,600 btus
- New technology provides better efficiency resulting in less than 10 percent less mileage

ECONOMICAL

- Installing a propane station is the least expensive alternative even as compared to gasoline or diesel stations
  - 4-7 HP electric motor
  - No ground water contamination
  - Non toxic
  - No costly EPA monitoring system
  - Low pressure, 100-300 psig
  - Low noise
  - 2000 gallon skid mounted system with basic dispenser for ~ $22,000-$30,000…installed!

FUELING INFRASTRUCTURE OPTIONS

ELECTRONIC DISPENSERS

- - High frame, Commercial Style
- - Key pad for secure self serve
- - Attractive retail design
- - Fully electronic dispenser
- - Nozzle boot handle actuation
- - Retail Displays:
- Total Sale
- Volume
- Price per gallon

COMPLETE SKID SYSTEMS

- Complete storage and pumping unit designed for Autogas
- Portable system ready for electrical connection
- Includes storage tank, secured accessories, electrical control panel, dispenser
- High flow rate valves, pump/motor and piping

PROPANE CYLINDERS

On-Road Propane

ASME motor fuel

Off-Road Propane

16 oz propane

Aluminum forklift

Aluminum mower

ASME MOTOR FUEL

Applications

Permanently mounted LP gas tank to power appliances in:

- Motorized recreational vehicles
- Propane engines
- Generators
- APU's (Auxiliary Power Units)
- Diesel fuel

Capabilities

– Diameters of 10" to 20"

– Overall lengths Of 21" To 48"

– Fuel capacities of 12 to 40 gallon

– Liquid and/or vapor withdrawal

– Powder coated finish

Manufactured in accordance with ASME (American Society Of Mechanical Engineers)

ALUMINUM MOWER CYLINDERS

Applications: Propane-powered lawn mowers

Capabilities: 5, 8 & 10 gallon capacity

Features:

- Horizontal use only
- Vapor service only: Includes LPD (Liquid Prevention Device) attached to end of vapor tube
- Includes fill valve with OPD (Overfill Prevention Device)
- **Left-Hand** connections: male & female
- Green collar for mower cylinder identification
- Additional labeling stating horizontal use only
- All other benefits associated with aluminum forklift cylinders

A. Float gauge (float shown; exterior read-out not visible)
B. Liquid fill valve with OPD (Overfill Prevention Device)
C. Vapor withdrawal tube/valve with LPD (Liquid Prevention Device)
D. Fixed liquid level
E. Safety relief valve
F. OPD (Overfill Prevention Device)

INCREASING PUBLIC FUELING ACCESS

CLEAN START

CleanFUEL USA, in conjunction with Texas State Technical College, received a $12.3 million Department of Energy grant to develop curriculum for alternative fuel vehicle technicians as well as install over 180 alternative fuel propane autogas refueling stations in select US metropolitan markets.

CLEAN START PROGRAM

- 184 LPG Public-Access Refueling Stations
  - 10 each in the following metropolitan areas:
    - Dallas/Ft. Worth, Austin/San Antonio, Houston, Atlanta, Chicago, Indianapolis, Seattle, Los Angeles, Sacramento, San Diego, Denver, Phoenix, St. Louis, Oklahoma City, Orlando (qty. 3), Louisiana IH-10
  - 31 upgrade sites completed by December 2010
- One Vehicle Service Center in Each Area
- Project Completion by: 12/31/2011

PROGRAM PARTNERS

- PERC
  - » Funding for Contractor's) and with boots on ground to drive City Plans”
  - » Funding for market research
- CFUSA
  - » Key “Marketer” to Potential Fleet users
    - › Fueling equipment supplier
    - › Fueling network operator
    - › Propane Engine Technology integrator
- ConocoPhillips
  - » Wholesale Propane supply
  - » Multi state branded marketing sites
    - › Corp. approval for Propane Marketing to work directly with retailers

PROGRAM PARTNERS

-Developing propane vehicle technician training curriculum

-Training and certification for mechanics with propane vehicle specific curriculum

- State of the art facility and instructors in Waco, TX

CASE STUDIES

PROPANE education & research COUNCIL

BRITISH COLUMBIA, CANADA

- *13 Days – 3500 Miles*
- *Cold Starts (-15C/5F)*
- *Mountain Passes*
- *Steep Grades (>10%)*

TRAVELING RIDE AND DRIVE TO BC SCHOOL DISTRICTS

- Visited over 25 school districts in BC operating mixed fleets, many with gas-to propane- aftermarket conversion experience
- Encouraged district supervisors to take the bus for a test-drive on their steepest-grade bus route.
- There were absolutely no negative comments made on performance or power, ……"as strong as a diesel."
- Fuel Economy during the trip was calculated at 7 MPG, which allowed for a range that exceeds Blue Bird's published 300 miles per tank with diesel.
- No problems related to cold starting or cold operating temperatures.
- One maintenance issue was reported to Blue Bird: Manifold bolts became loose and required a re-torque after approximately 1000 miles. They were rechecked at 3500 miles, and had held.
- First Propane Vision in Canada Sold in Vancouver.

COMPETITIVE LAWN SERVICE

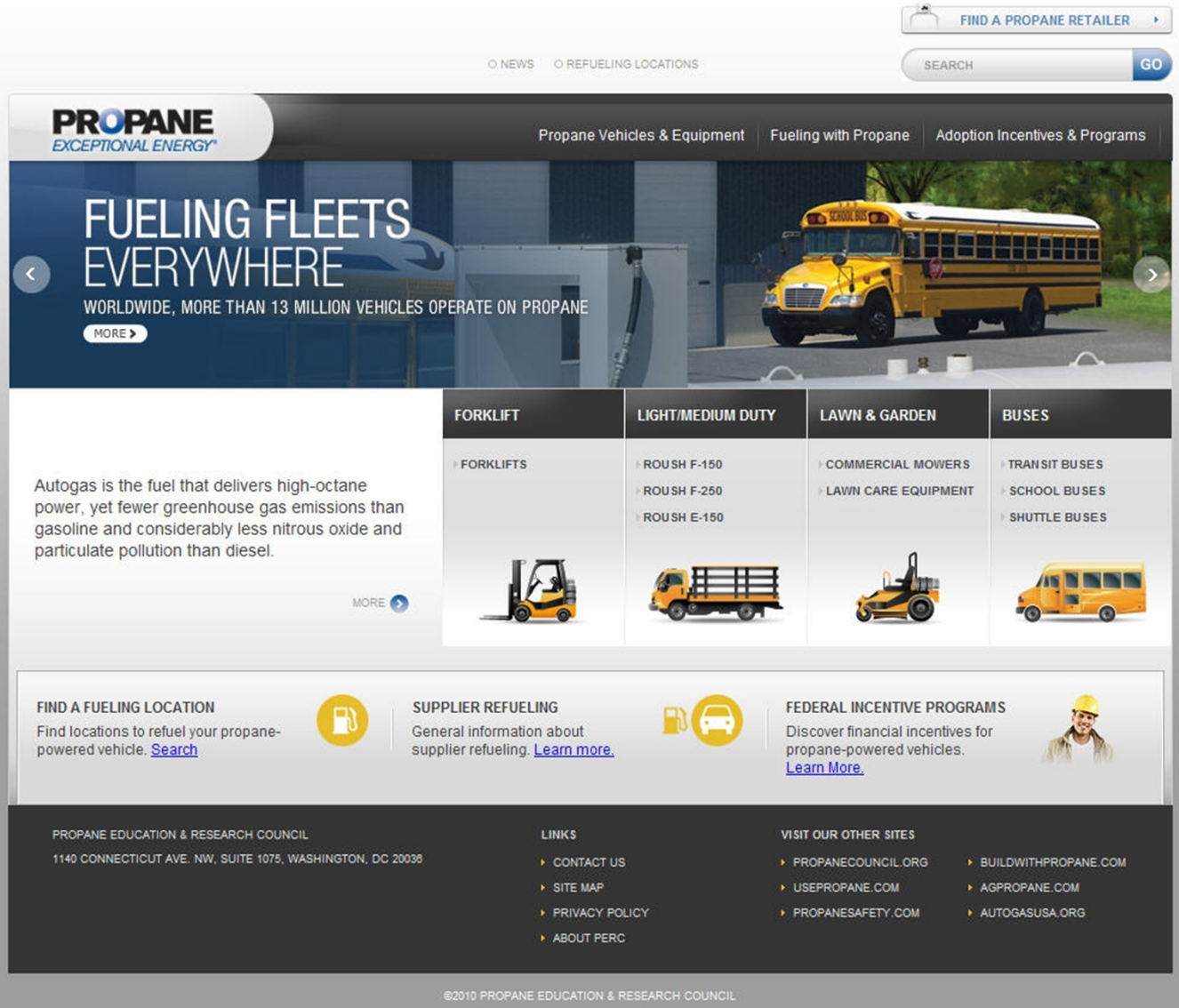
- Goal of 100% Propane
- 30-50% less than gasoline
- Reduced mower maintenance
- < 2 year payback

Eric Hansen takes keys from Jack Roush

COMMERCIALIZATION

PROPANE education & research COUNCIL

WWW.AUTOGASUSA.ORG



PROPANE ROAD SHOWS

ENGINE FUEL WEBINARS

- Over 2500 people have attended a series of propane webinars in the past few years.
- WWW.PERCThirdThursday.net
- Webinar examples include:
  - Aftermarket Opportunities for Fleets and Propane Fuel Suppliers
  - Propane Fueling and Infrastructure
  - Propane Lift Trucks
  - Propane Commercial Mowing
  - Propane Shuttle Busses
  - Installation & Sizing of Propane Generators

2011 PROPANE ENGINE FUEL SUMMIT

- Over 400 watched live
- 35 Presenters
- Archives available at: www.propaneenginefuelsummit.com

PROPANE TECHNOLOGY TRAINING

Engine Fuel

Residential

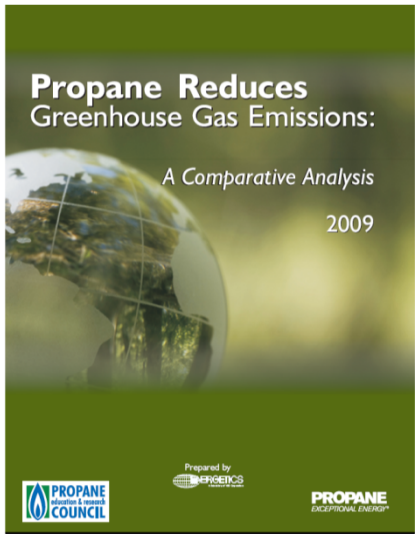
Agriculture

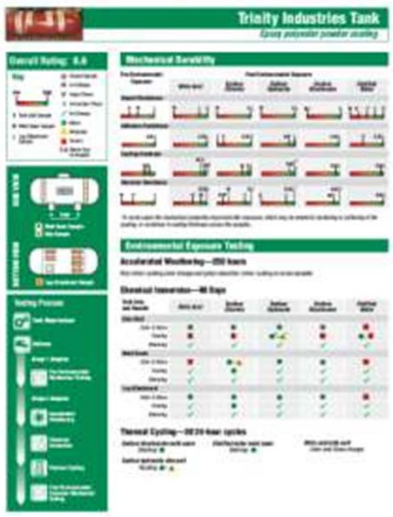
PROPANE TECHNOLOGY TRAINING

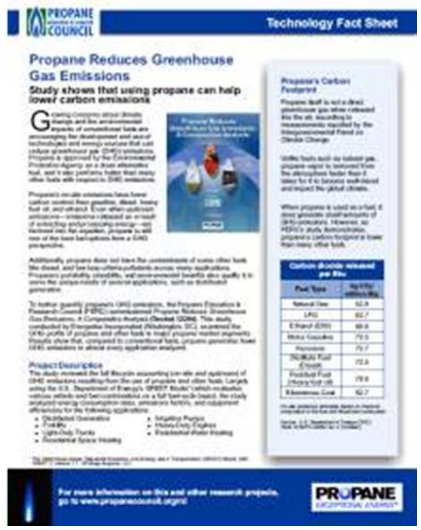
- Workshops open to all Propane Marketers
  - In-person Sessions
    - Scheduled Around the Country
    - 4-6 Hours Long
    - Class Limited to ~20, Advance Registration
  - Web-based Sessions
    - 2 Hours Long
    - Open to All, No Class Size Limit

OTHER RESEARCH PROGRAMS

- Greenhouse gas emissions report
- Underground tank coatings performance study
- Remote monitoring systems comparison study
- Technology fact sheets








PROPANE
EXCEPTIONAL ENERGY®