

# Autogas Answers

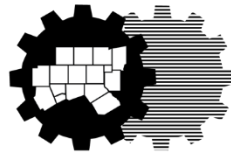
December 17, 2020

10 – 11:30 a.m.

Webinar



**Dallas-Fort Worth  
CLEAN CITIES**



**North Central Texas  
Council of Governments**



**PROPANE  
COUNCIL  
OF TEXAS**



North Central Texas  
Council of Governments



Dallas-Fort Worth  
CLEAN CITIES

# Autogas Answers for School Districts DFWCC and Propane Council of Texas

Your microphones will be muted.

Please submit QUESTIONS in the Q&A at bottom.

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GPSINSIGHT



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# Autogas Answers for School Districts DFWCC and Propane Council of Texas

This meeting IS being recorded.



Dallas-Fort Worth  
CLEAN CITIES



North Central Texas  
Council of Governments

December 17, 2020



# Agenda

**10:00 - Welcome and Overview – Amy Hodges, D/FW Clean Cities Coalition**

**10:05 - Propane Benefits and Technology Overview – Steve Whaley, Business Development Director, Propane Education and Research Council (PERC)**

**10:30 – Mowers – Matt McDonald, Director of Off-road Business Development, PERC**

**10:40 – Technology and Propane Bus – Tom Hopkins, Business Development Manager, Roush CleanTech**

**10:55 – Prosper ISD Introduction**

**11:00 – Grant Availability in Texas – Heather Ball, Grants Advisor, Propane Council of Texas**

**11:15 – Discussion/Questions & Answers**

**11:30 - Closing Remarks – D/FW Clean Cities Coalition**

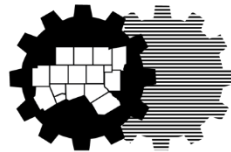


# Amy Hodges

Dallas/Fort Worth Clean Cities  
Sr. Air Quality Planner  
Welcome and Overview



**Dallas-Fort Worth  
CLEAN CITIES**



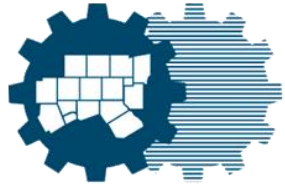
**North Central Texas  
Council of Governments**



**PROPANE  
COUNCIL  
OF TEXAS**

# Who and What is NCTCOG?

## Regional Planning Agency



North Central Texas  
Council of Governments

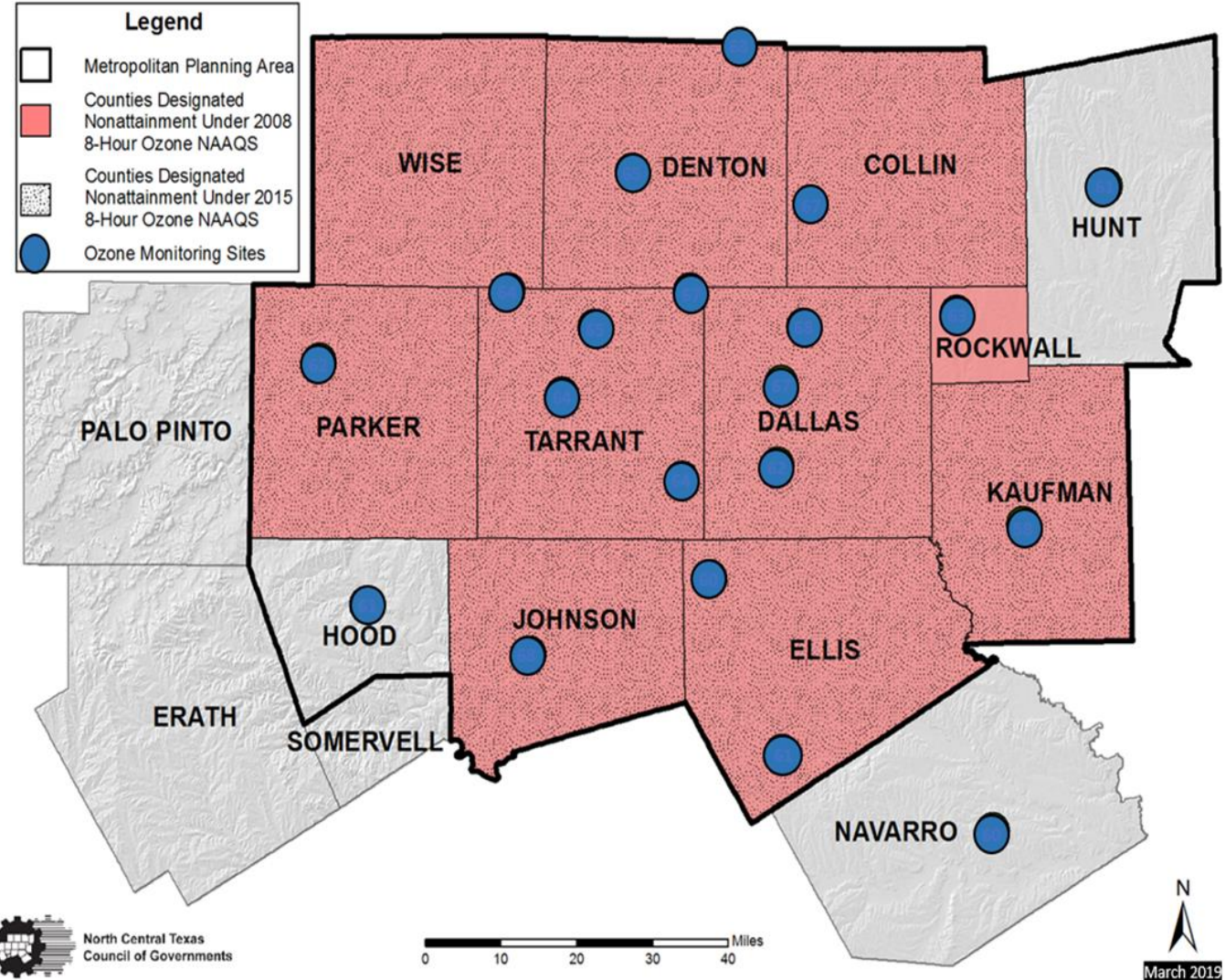
## Metropolitan Planning Organization (MPO)



## DFW Clean Cities Coalition



Dallas-Fort Worth  
CLEAN CITIES





# Clean Cities Portfolio



**Light-,  
Medium-, and  
Heavy-Duty  
Vehicles**



**Alternative and  
Renewable  
Fuels and  
Infrastructure**



**Idle Reduction  
Measures and  
Fuel Economy  
Improvements**



**New Mobility  
Choices and  
Emerging  
Transportation  
Technologies**

# Measuring Clean Cities Coalition Impact

Coalition projects have resulted in a cumulative impact in energy use equal to nearly **10 billion** gasoline gallon equivalents resulting from reduced fuel use and increased fuel diversity.<sup>1</sup>



Enough to drive the distance to the sun and back

**1,175**  
times



Enough fuel to fill nearly

**1.2 million**  
tanker trucks

Coalition projects have helped to put nearly **1 million alternative fuel vehicles** on the road.<sup>2</sup>



**96 million gasoline gallon equivalents**

of energy were saved through fuel economy improvement projects like telematics, driver training, and outfitting fleets with idle reduction equipment.<sup>2</sup>





# Technology Integration Program

Provide objective/unbiased data and real-world lessons learned that inform future research needs and support local decision-making

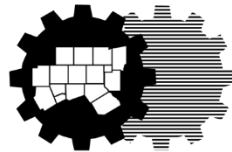


# Steve Whaley

Propane Education & Research Council (PERC)  
Director, Business Development  
Propane Benefits and Overview



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**PROPANE  
COUNCIL  
OF TEXAS**



# **Autogas Answers** **Dallas / Fort Worth Clean Cities**

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**Stephen Whaley**

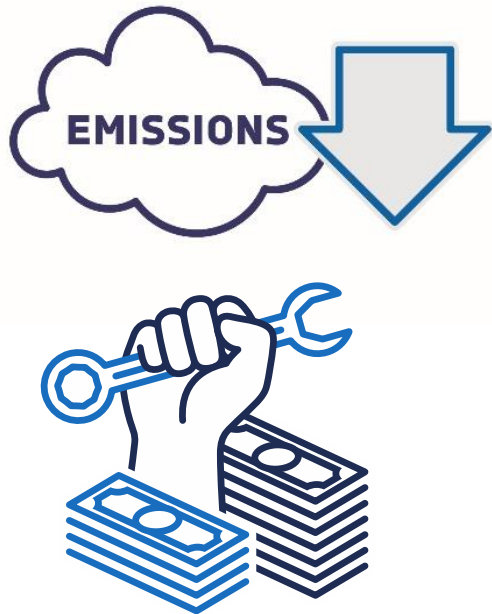
Director of Autogas Business Development  
[Stephen.Whaley@propane.com](mailto:Stephen.Whaley@propane.com)

864-606-2290

# Successful Alternative Energy Adoption



# What Makes an Alternative Energy Adoption Successful?



- Reduced emissions without increasing cost or losing efficiency.
- TCO reduction or ROI realized before the end of the lifecycle.
- Similar (or better) performance than the original fuel without compromising range.
- High-volume supply of energy domestically sourced.

# How Does Autogas Fit Into The Conversation?



- Most cost-effective energy source to reduce NOx emissions.
- Lowest total cost-of-ownership of any fuel.
- Comparable or improved performance without compromising range.
- U.S. production = 28 billion gallons in 2019.
  - 9 billion used domestically.
  - 19 billion gallons exported.



# WHAT IS PROPANE?

- Affordable, Clean, American-Made Fuel
  - $C_3H_8$
  - Byproduct of natural gas processing.
  - 100% Domestic
  - Commonly used for space and water heating, cooking, and as engine fuel.
- Using Propane
  - 48 million Households
  - 900,000 Farms
  - 600,000 Forklifts
  - 25,000 Commercial Mowers

Propane comes from organic as well as renewable sources.

It's nontoxic, meaning it does not contaminate air, soil, or water resources.





# WHY FLEETS CHOOSE PROPANE AUTOGAS

Total Cost-of-Ownership

Lower Emissions

Reduce Noise

Less Maintenance/Increased Uptime

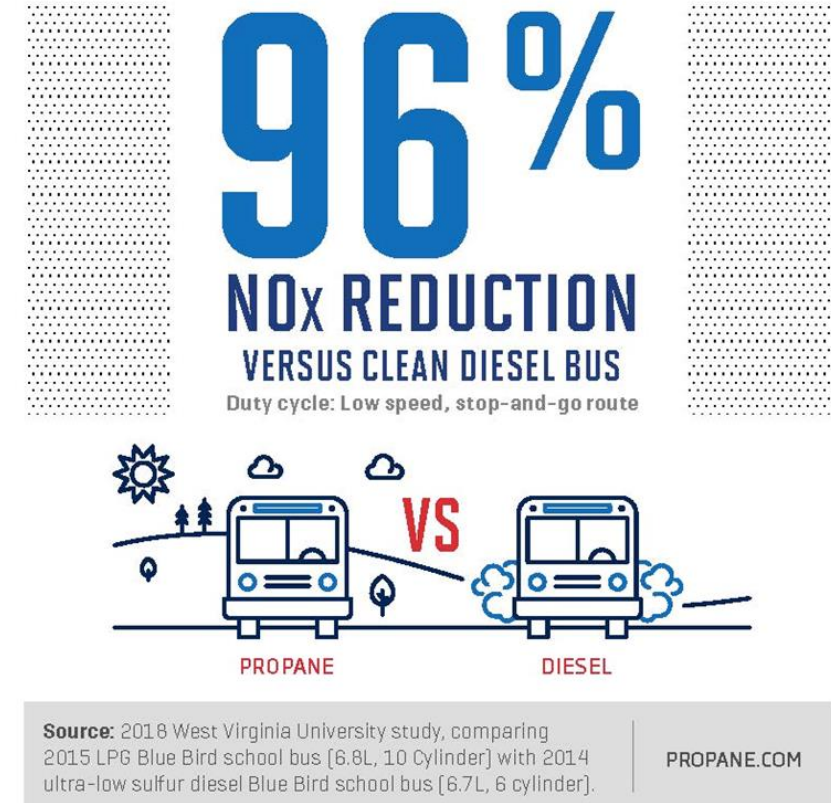
Improve Corporate Image

Employee Morale/Driver Retention



# Path to Zero Emissions

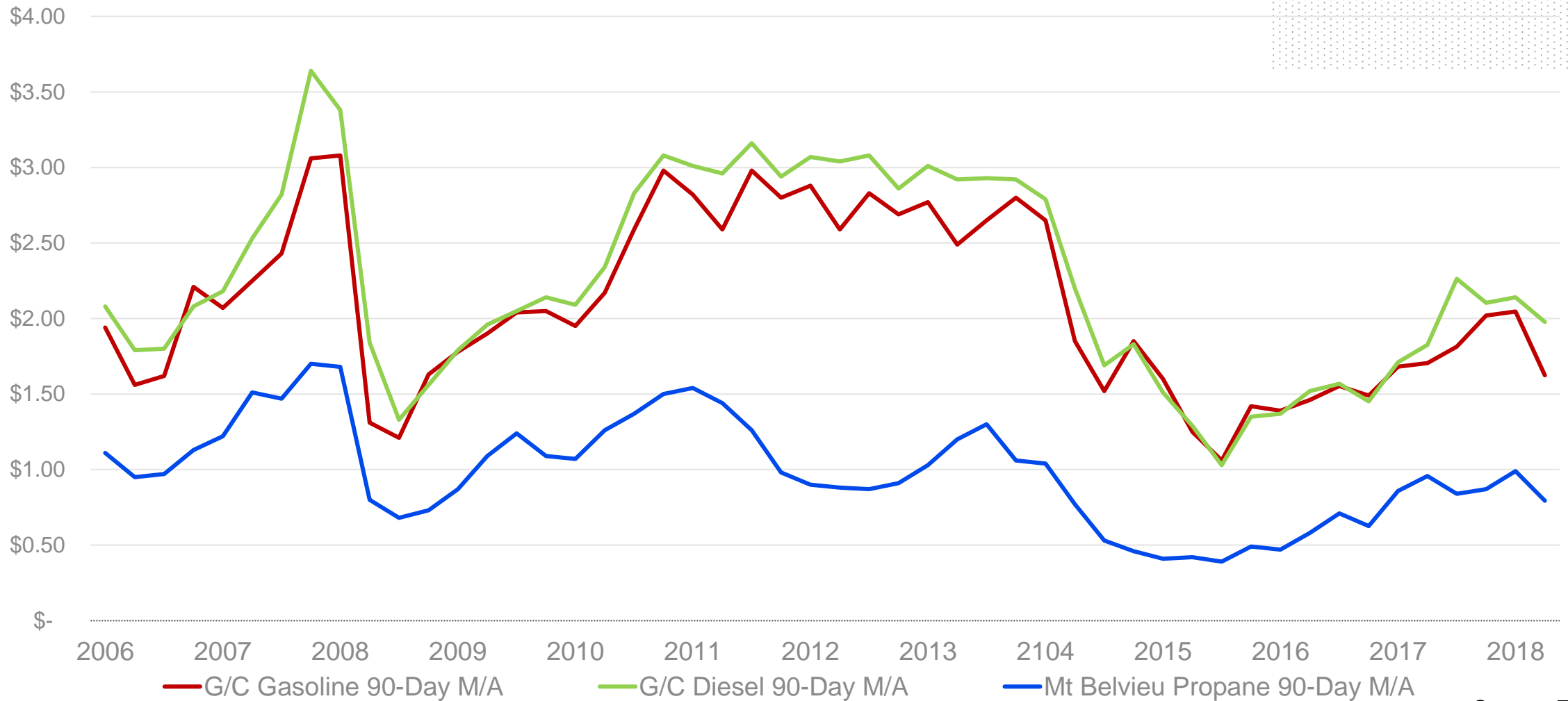
- Particulate Matter
  - Virtually zero
  - Zero with renewable propane
- NOX
  - 96% reduction from best in class diesel
  - Certifying to .02, operating at 0.01, full duty cycle
- GHG
  - New technologies 25% reduction from next best technology



# Fuel & Maintenance Cost Reductions



# US ENERGY PRICE COMPARISON 2006 – 2018



Source: EIA.gov

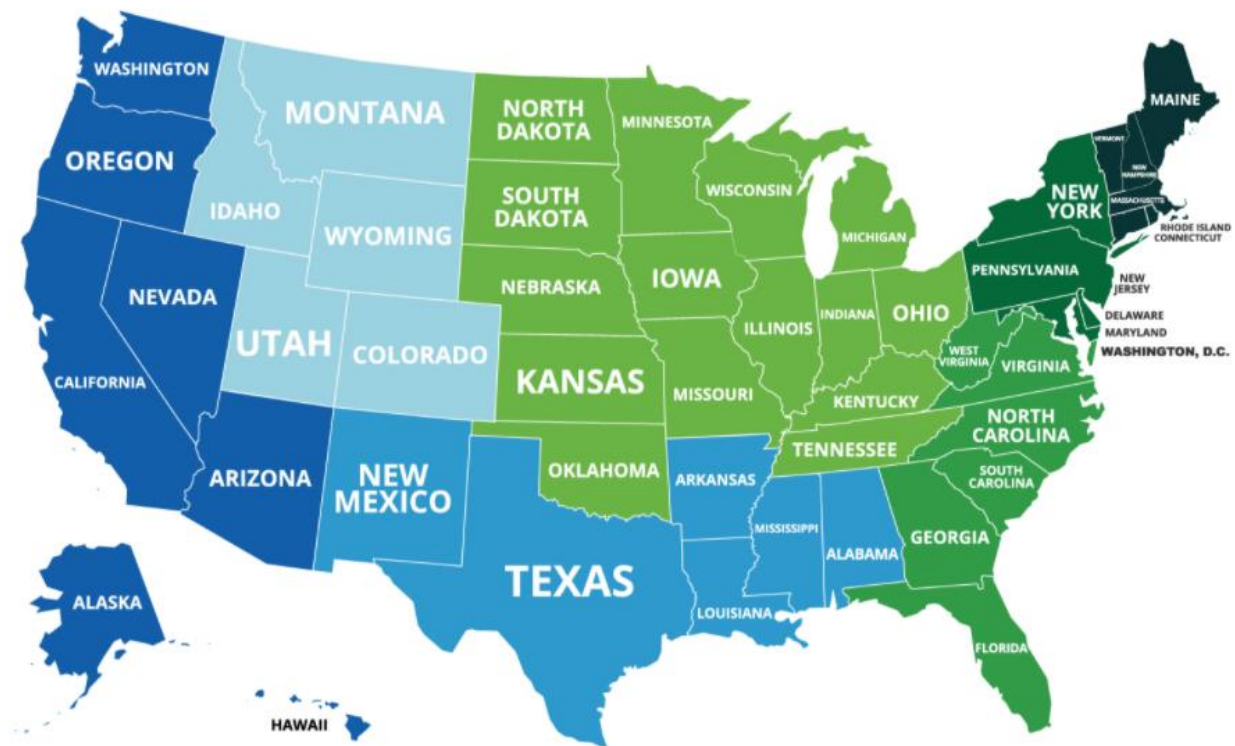
# Today's Propane Autogas

## Average Price Per Gallon for the week of December 1, 2020

These prices are based on National averages. To receive a custom quote with your local autogas pricing, [contact us today](#).

Learn more about the [savings](#) and [stability](#) of autogas.

<b>\$1.53</b>	<b>\$1.43</b>	<b>\$1.37</b>	<b>\$1.47</b>	<b>\$1.48</b>	<b>\$1.53</b>	<b>\$1.48</b>
West Coast	Rocky Mountain	Gulf Coast	Midwest	Lower Atlantic	Central Atlantic	New England



# Current Autogas Vehicle Offerings









# OEM Propane Options

- Light & medium duty Ford trucks & vans, school bus.
- Factory Ford warranty maintained.
- No loss of HP / torque / towing capacity.
- Serviceable with existing diagnostic equipment.
- EPA & CARB Certified.

**ROUSH**<sup>®</sup>  
**CLEANTECH**



Ford F-53 / F-59



Ford E-350/450



Ford F-450/550



Ford F-650/750



Blue Bird Vision

Micro Bird G5



# OEM Propane Options



- Updated and improved to increase reliability.
- The entire powertrain is sold, warranted, and supported by Freightliner Custom Chassis.



## 2020 Model Year Products



### **F150**

**3.3 PFDI**

**5.0 PFDI**

**2.7/3.5 PFDI**

**(SUMMER 20)**

### **F250-F350**

**6.2 PFI**

### **F450-F750**

**7.3 PFI (2021 MY)**

### **E450**

**6.2 PFI**

**7.3 PFI (2021 MY)**

### **TRANSIT**

**3.5 PFDI**

**3.5 ECOBOOST**

**(FALL 20)**

### **EXPLORER**

**3.3 PFDI**



### **SILVERADO 1500**

**5.3 DI**

### **SILVERADO 2500/3500**

**6.6 DI**

### **EXPRESS/SAVANA**

**6.0 PFI**



### **DURANGO**

**5.7 PFI**

### **CHARGER**

**3.6 PFI**

### **RAM**

**5.7 PFI**

**3.6 PFI**

**(SUMMER 20)**





# ***Icom's certified Medium Duty Platforms***

***The Icom JTG II system is EPA Certified & CARB approved for over 1,200 2009-2019 vehicle platforms including many Ford and GM models.***

***The Total Solution for any Type of Fleet!***



**E450 - CARB approved  
2016-2017**



**F350 F450 F550**

**\*FORD NEW 7.3L engine available Spring 2020!  
Taking orders now!**



**F750**



**F53 F59 (BAKERY, LINEN,  
FEDEX TYPE BOX TRUCKS)**



**6.0L HD**

*Please confirm with Icom engine family*



**Chevy Cutaway  
Coming soon!**



# CAMPBELL PARNELL AND ISUZU NPR

- Bi-Fuel conversions Pre or Post delivery
- 5 year warranty and maintenance packages available
- Plug and Play for ease of installation and service
- CP works directly with the OEM for product development
- EPA and Carb Certification



**CAMPBELL-PARNELL**  
*www.UseAltFuels.com*













# Propane School Bus Testimonial: Northside Independent School District



Watch later



Share

## More videos



0:01 / 2:56



YouTube




# SNAPSHOT OF PROPANE AUTOGAS SCHOOL BUS MARKET

**1,250,000**

STUDENTS TRANSPORTED

..... **DAILY** .....

STATES WITH  
**14**   
**500+ BUSES**

.....  
**1,000** DISTRICTS &  
CONTRACTORS  
OPERATE PROPANE  
AUTOGAS BUSES  
.....

**21,000+**

PROPANE AUTOGAS BUSES

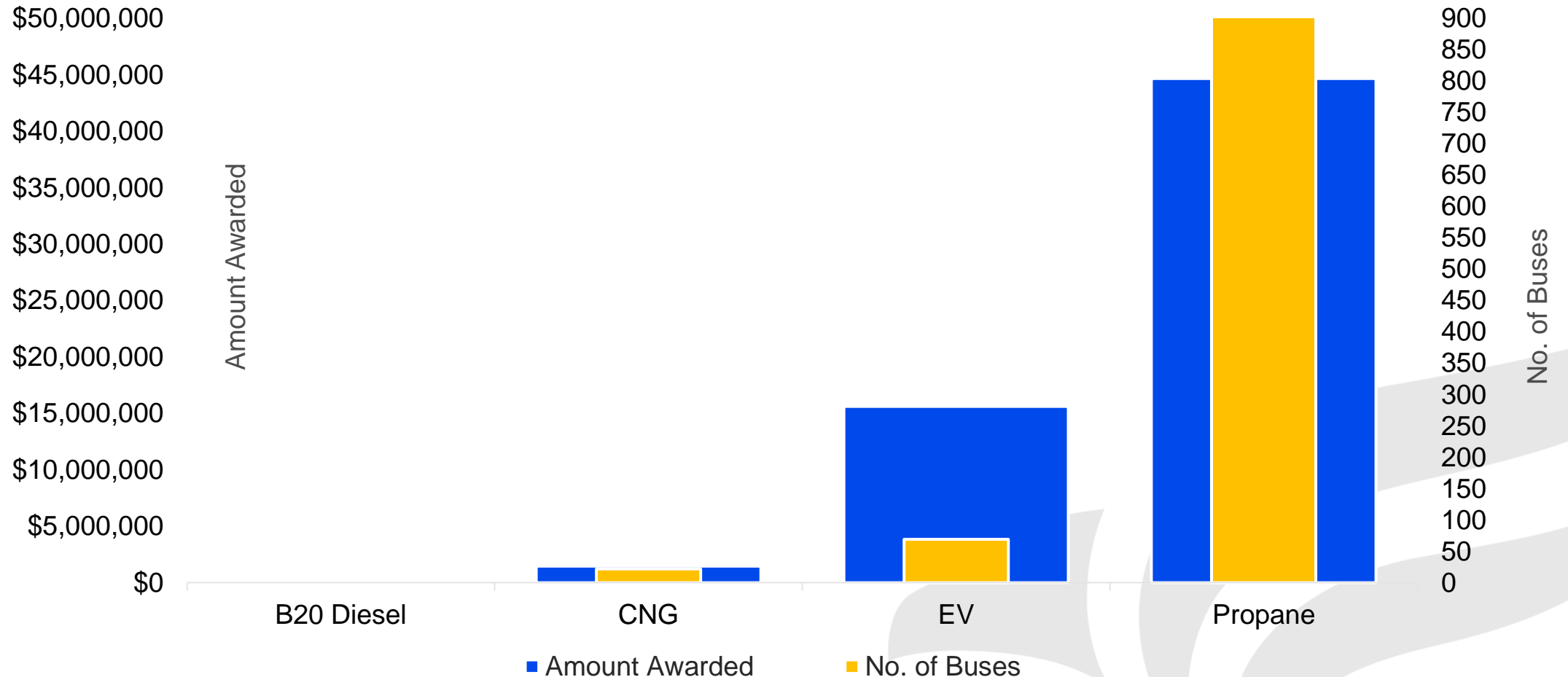
..... **ON THE ROAD** .....



# Similarly Equipped Blue Bird Type C Bus

Diesel, Cummins, ISB, 6.7L	\$98,500.00
LPG, Ford/Roush, 6.8L	\$107,000.00
CNG, Ford/Roush, 6.8L	\$134,000.00
Electric, Cummins	\$385,000.00

# VW: School Bus Funding & No. of Buses Through July 20, 2020



Source: Propane Education & Research Council



# Study: Comprehensive Alt-Fuel Approach Better Than Single Technology Focus

	Texas	California	Result
On-Road Funds Spent	\$561 million	\$816 million	CA spent 46% more
NOx Reduced	61,610 tons	35,299 tons	CA accomplished 43% less
Total # of Investment Years (2005-19)	15 years	15 years	TX reduced more emissions while spending less

California regulators spent 46% more public money while accomplishing 43% less than Texas.

Photo: NGVAmerica

<https://www.worktruckonline.com/10129055/study-shows-comprehensive-alternative-fuels-approach-achieves-greater-emissions-reductions-than-single-technology-focus>

# Emerging Vehicle Markets



# Top Targets For Alternative Fuel Adoptions

- Medium duty trucks.
  - Class 3-7.
- High volume fuel consumption.
  - 300 to 900+ gallons per month.
- Regional routes.
  - 75 to 300+ miles per day.

## EMERGING MARKETS

# Food/Beverage

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- Major companies have already validated propane autogas in this market.
  - ReadyRefresh by Nestlé Waters.
  - Schwan's Home Delivery.





## EMERGING MARKETS

# Paratransit

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- 25,000 paratransit vehicles nationwide.
- 600 gallons per month average fuel consumption.
- ADA requires every county in the U.S. to provide service.



## EMERGING MARKETS

# Parcel/Package

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- USPS has 92,000 routes for moving mail.
  - Over 70,000 routes are performed by independent contractors.
- There are approximately 10,000 class 6-7 straight box trucks operated by USPS contractors.
- Contractors bidding on USPS routes score higher with alternative fuel vehicles.
- 1,000 gallons per month average fuel consumption.



# Autogas Infrastructure



# Fueling Infrastructure - Mobile Refueling

- **Best Option:** Fleet has limited space for on-site infrastructure.  
  
Your fleet can take advantage of propane autogas even if your plans are uncertain about investing in infrastructure in the near future.
- Mobile refueling is arranged with your local propane retailer.
- At a scheduled time, your retailer will refuel your fleet vehicles on-site, one by one.

*Costs and situations vary; talk to an area propane retailer for more details.*





# Temporary Refueling set-up

- **Best Option:** Fleet is in the process of building permanent refueling infrastructure.
- **Includes:** Exact setup varies, but generally includes a dispenser and fuel tank mounted on a trailer.

This option keeps fleets fueled with a temporary, self-contained refueling setup.

- A propane retailer owns all the equipment, and your fleet refuels using the tank and dispenser for as long as necessary.

*Costs and situations vary; talk to an area propane retailer for more details.*



# Temporary Refueling set-up





# Standard private station

- **Best Option:** Fleet of 50 vehicles or fewer.

**Includes:** A 1,000-3,000-gallon tank, plus a single autogas fuel dispenser.

Like an advanced private station, you or your propane provider own the infrastructure.

- If your propane provider owns the infrastructure, you're responsible for site preparation (crash protection and electrical).
  - Propane provider owns the infrastructure — Your cost: \$1,500-\$15,000 (site preparation)
- If you own the infrastructure, you purchase the propane tank, pump, motor, and dispenser for a convenient central refueling location.
  - Fleet owns the infrastructure — Your cost: \$1,500-\$15,000 (site preparation) + \$20,000-\$60,000 (infrastructure)



# Standard private station





# Standard private station



# Standard private station





# Advanced private station

- **Best Option:** Fleet of 50 vehicles or more.

**Includes:** A high-capacity tank, a canopy, and multiple fuel dispensers.

With this setup, either you or your propane provider own the infrastructure:

- If your propane provider owns the infrastructure, you're responsible for site preparation (crash protection and electrical).
  - Propane provider owns the infrastructure — Your cost: \$5,000-\$75,000 (site preparation)
- If you own the infrastructure, you pay for the cost of a canopy, propane tank, pump, motor, and dispenser with card lock and vehicle tracking capability.
  - Fleet owns the infrastructure — Your cost: \$5,000-\$75,000 (site preparation) + \$60,000-\$225,000 (infrastructure)



# Advanced private station





# Custom Advanced private stations



# Dispenser Options

- Credit card reader
- Transaction receipt printer
- Hose retractor
- Quick connect (Euro) nozzles
- Fully integrated, customizable fuel management system
- Third party fuel management system connections
- Telemetry







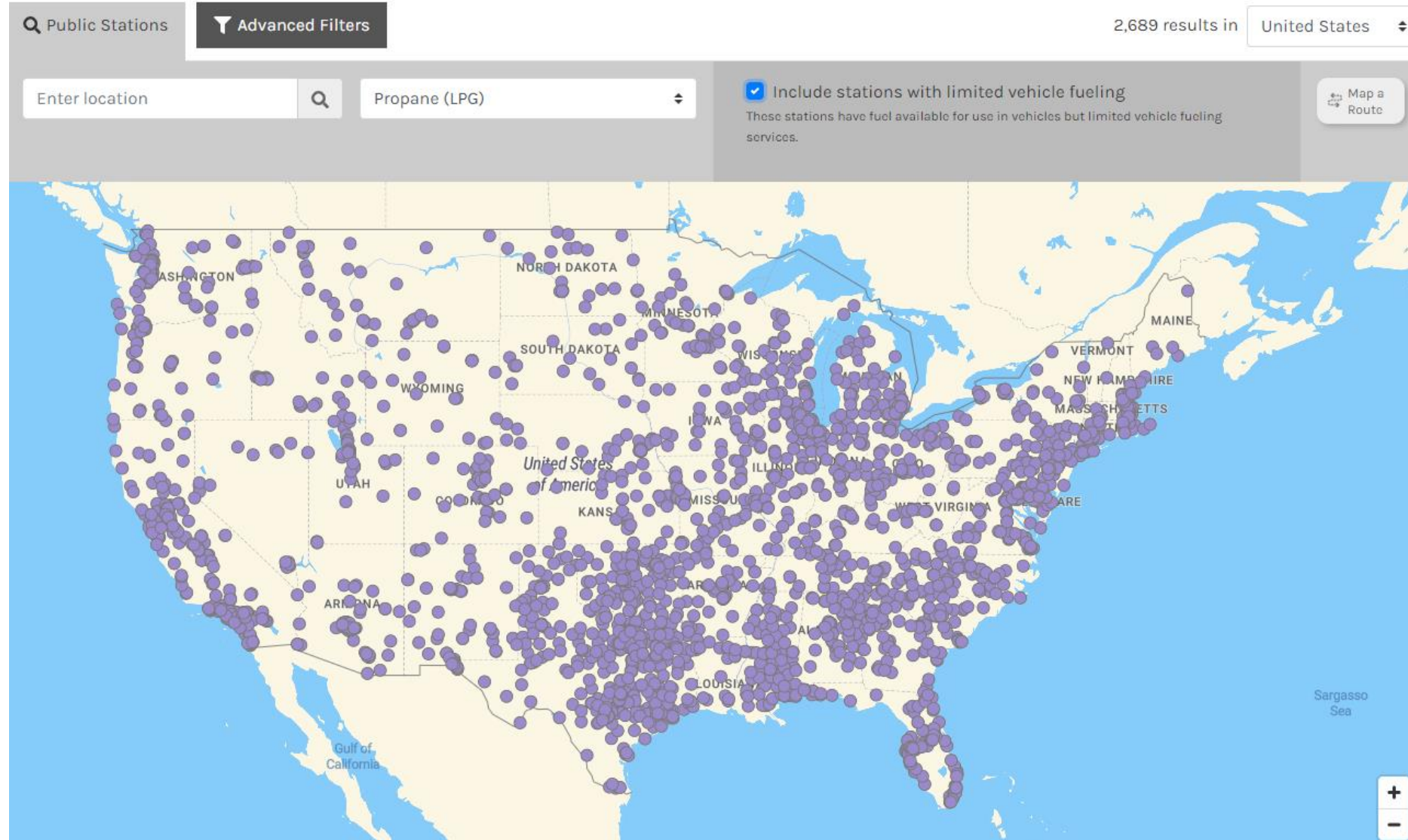
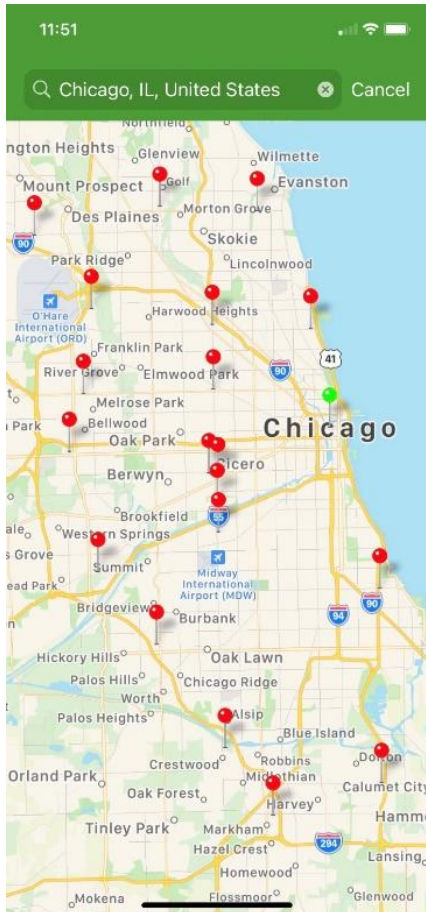


# Fueling infrastructure cost for 10 Shuttles

- Diesel = \$0k (already existing)
- Propane = \$40k
- CNG = \$200k (ten fixed time fill hoses)
- Electric = \$250k (ten fixed plug in lines)



# Dept of Energy Alt Fuel Station Locator



# Technological Innovations

# CUMMINS 6.7L PROPANE DEMONSTRATION ENGINE





# B6.7 PROPANE DEMONSTRATION ENGINE ARCHITECTURE

## Base Engine

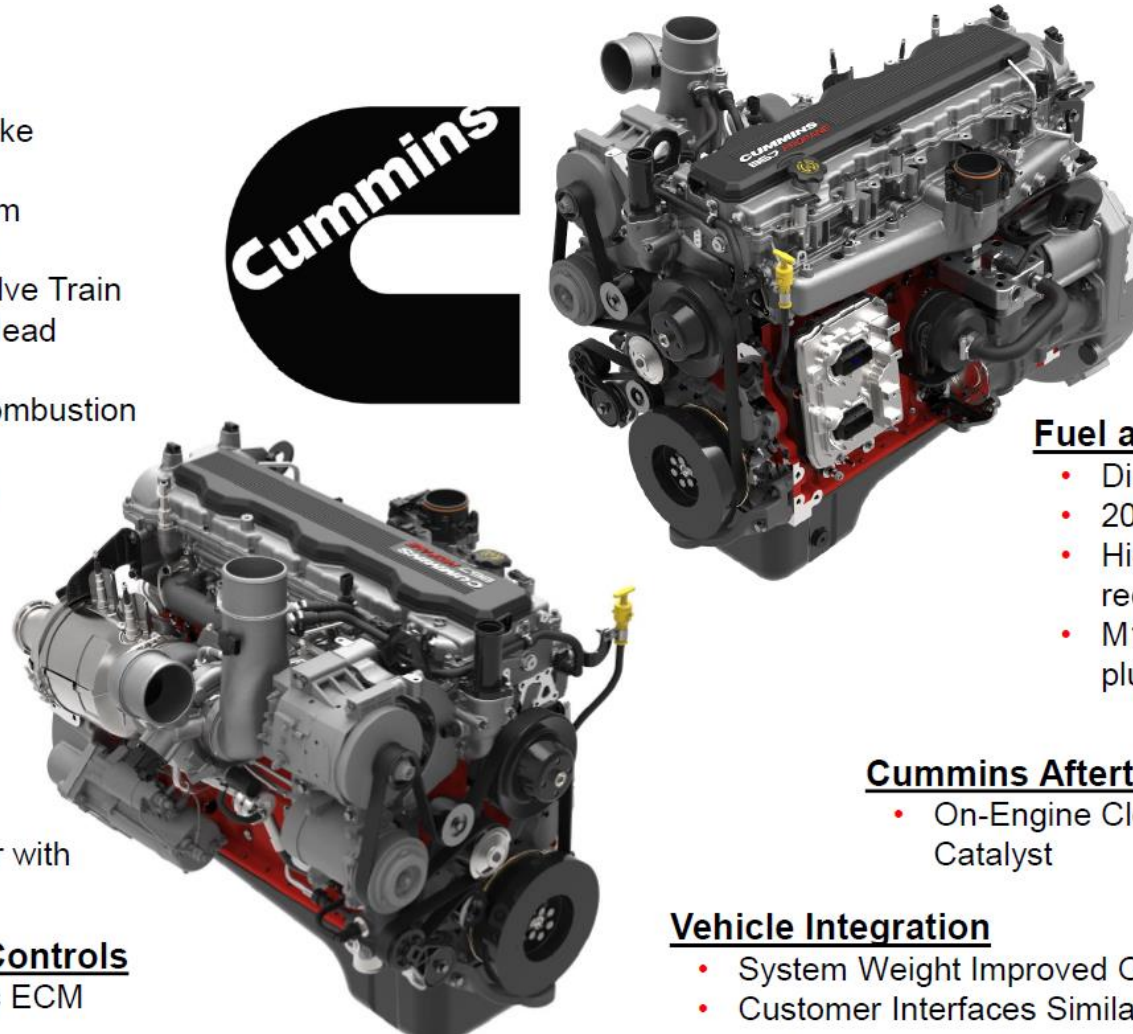
- 6.7L Displacement
- 107 mm Bore x 124 mm Stroke
- 12:1 CR
- Late Intake Valve Closing cam
- 4 Head Bolt Gray Iron Block
- Dual Overhead Camshaft Valve Train
- 4 Valve Aluminum Cylinder Head
- 174 bar PCP Limit
- High Efficiency Pent Roof Combustion Chamber
- High Tumble Charge Motion Intake Ports
- Leverages B6.7 Diesel Components Where Applicable for Increased Reliability and Durability

## Air Handling System

- Twin Entry, Dual Scroll, Wastegate Turbocharger with Command WG

## Electronics/Controls

- SI Specific ECM



## Fuel and Ignition System

- Direct Propane Injection
- 200 bar Rail Pressure Capability
- High Pressure pump w/ recirculation
- M14 Spark Plug w/ single coil on plug inductive ignition system

## Cummins Aftertreatment System

- On-Engine Close Coupled Three Way Catalyst

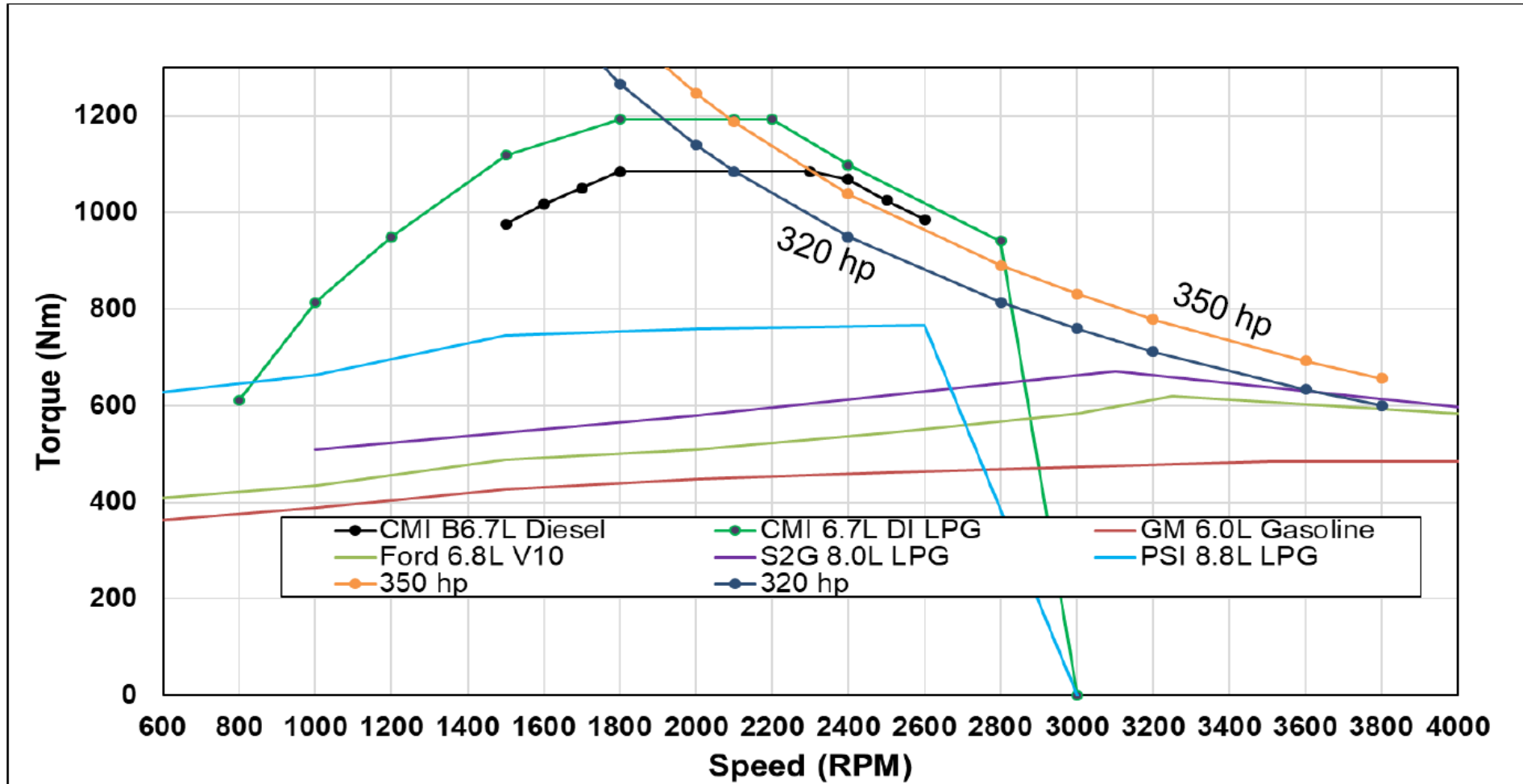
## Vehicle Integration

- System Weight Improved Over B6.7 Diesel
- Customer Interfaces Similar to B6.7 Diesel





# TORQUE CURVE COMPARISON



Renewable Propane

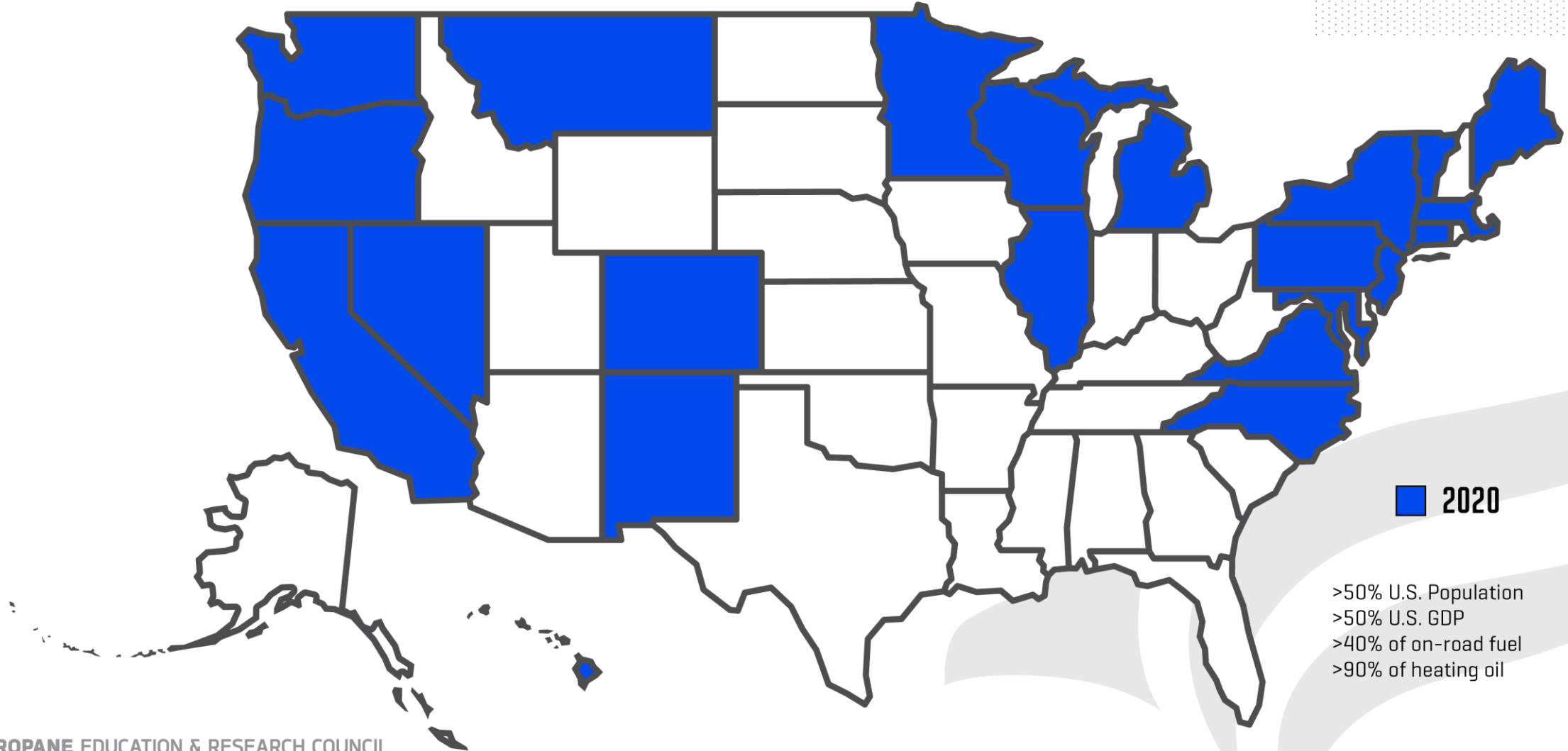
# **The Future of Propane Autogas**

© 2006 The Authors  
Journal compilation © 2006 Blackwell Publishing Ltd






# Comprehensive Carbon Goals





# Renewable Propane

- Low carbon intensity.
  - Inexpensive feedstock.
  - Abundant feedstock.
  - Low energy conversion.
  - Final product competitively priced.
- 

# Current Renewable Propane Sources

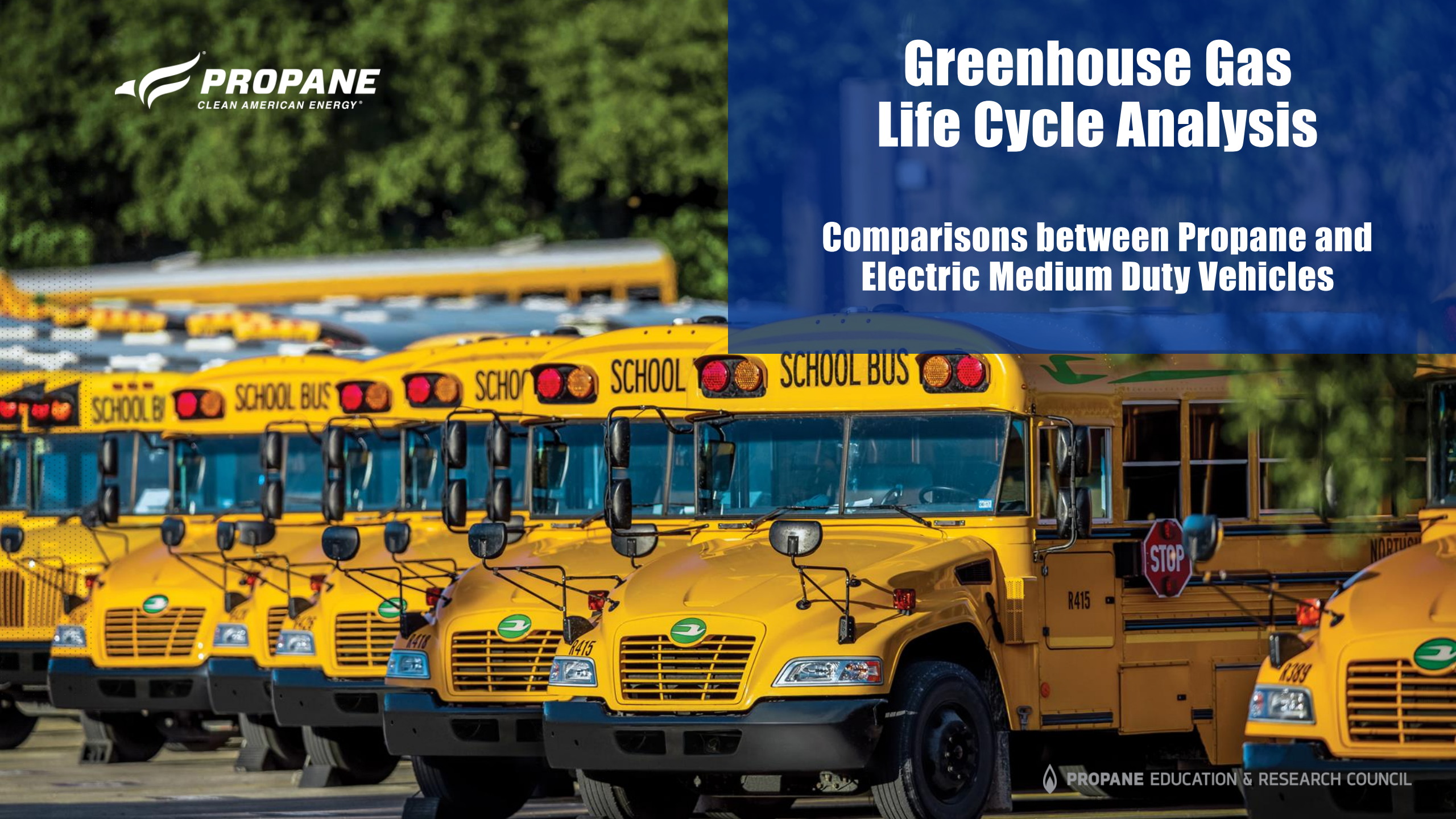






# Greenhouse Gas Life Cycle Analysis

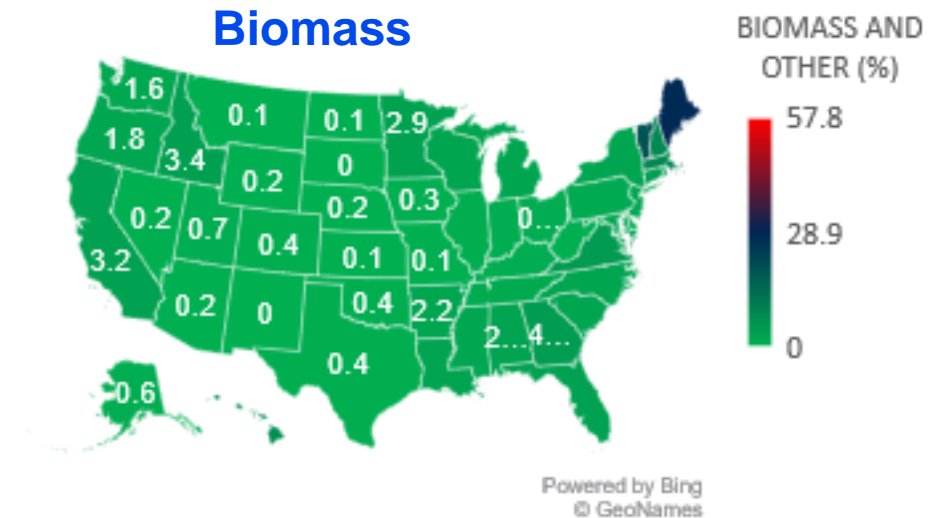
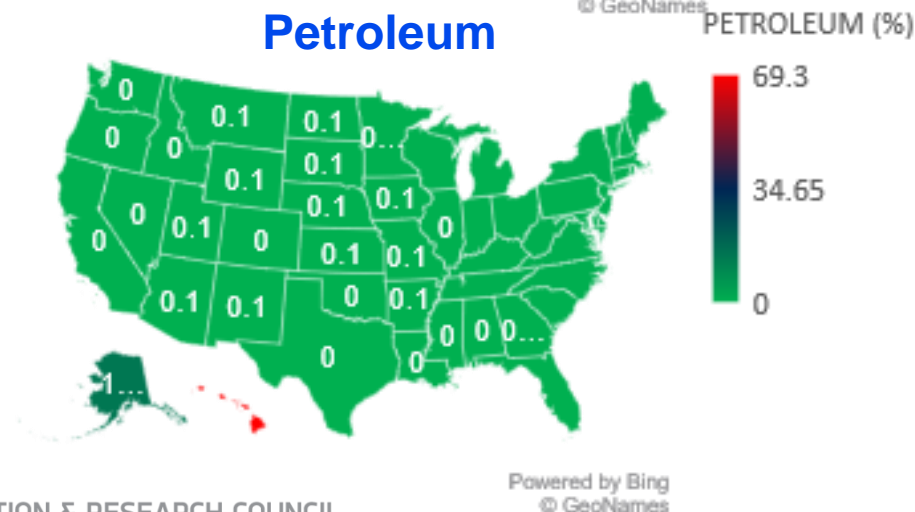
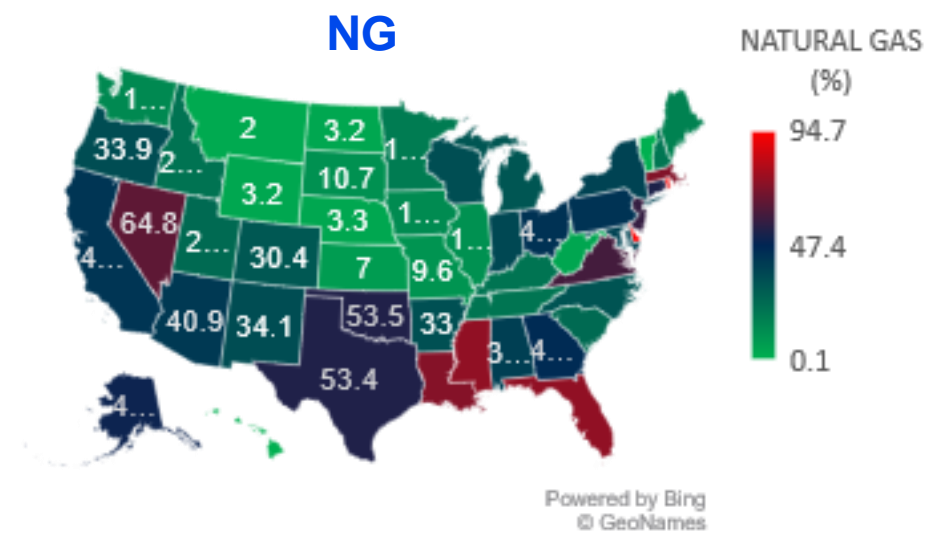
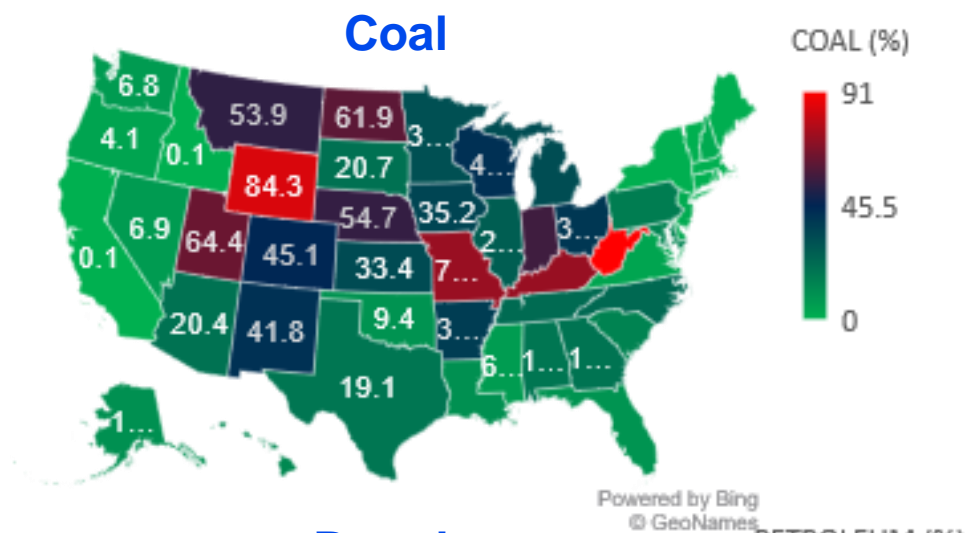
**Comparisons between Propane and  
Electric Medium Duty Vehicles**





## STATE OF THE ELECTRICAL GRID

# 2019 Electrical Grid Source Energy Mix – Fossil and Biomass

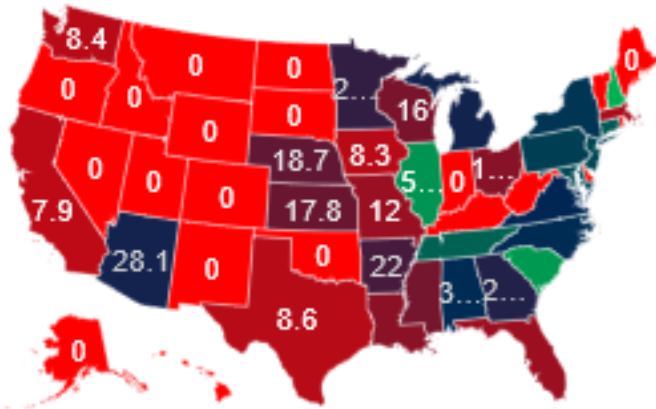


## STATE OF THE ELECTRICAL GRID

# 2019 Electrical Grid Source Energy Mix – Renewables and Nuclear

### Nuclear

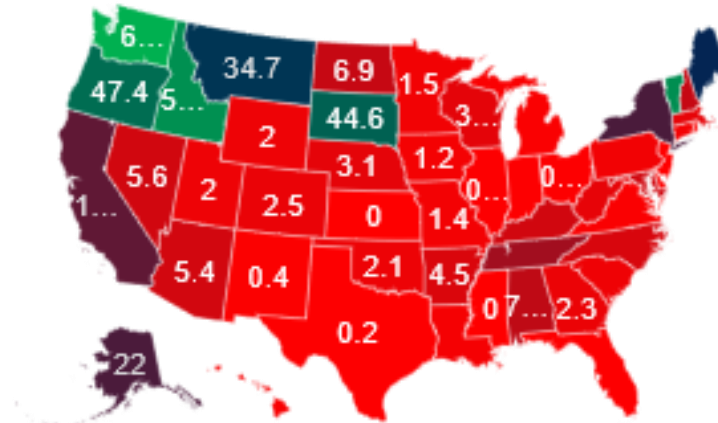
NUCLEAR (%)



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### Hydro

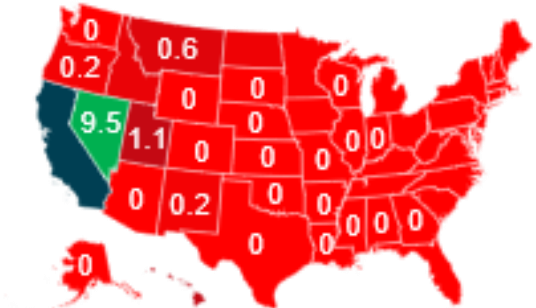
HYDRO (%)



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### Geothermal

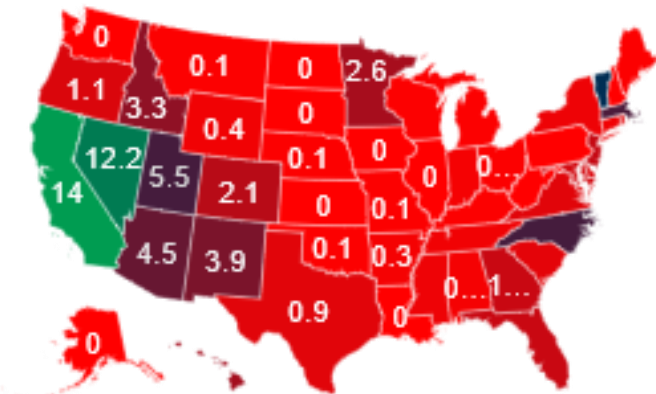
GEOOTHER...  
(%)



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### Solar

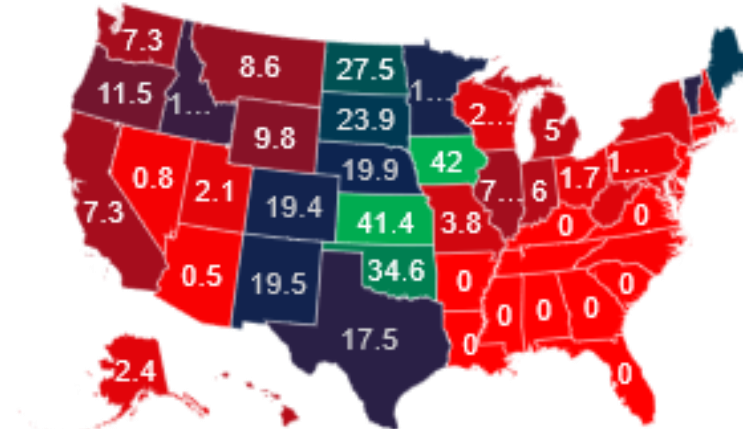
SOLAR - PV (%)



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### Wind

WIND (%)



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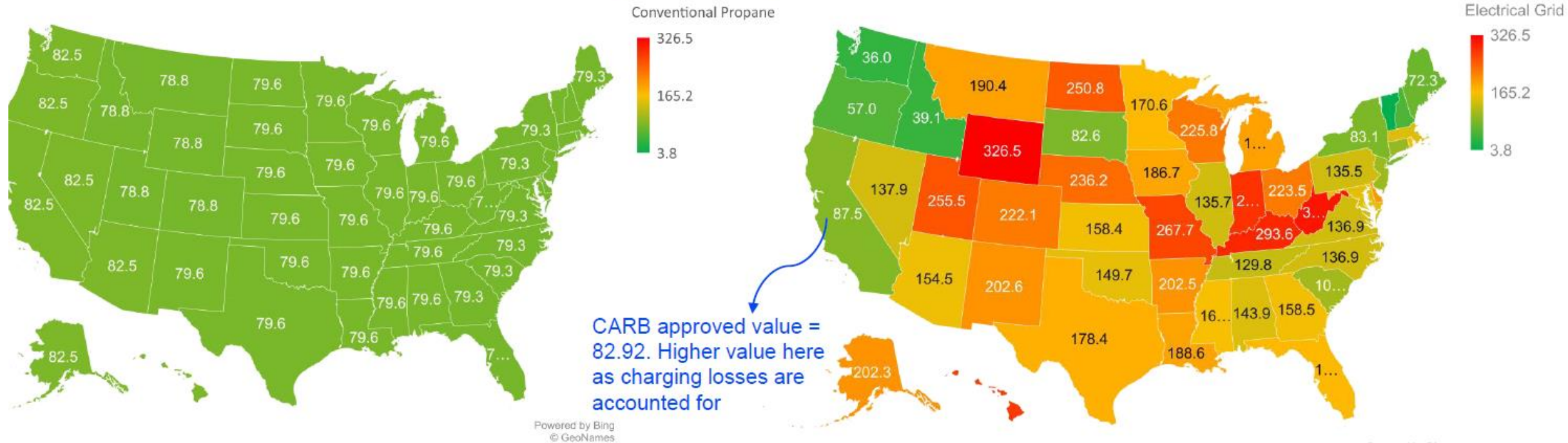




## CI COMPARISON

# Well-to-Wheels Carbon Intensity Comparisons of “Fuel” (gCO<sub>2</sub><sub>eq</sub>/MJ)

Note: They are compared on the same scale



Propane

Grid Electricity

# Simulated Cases

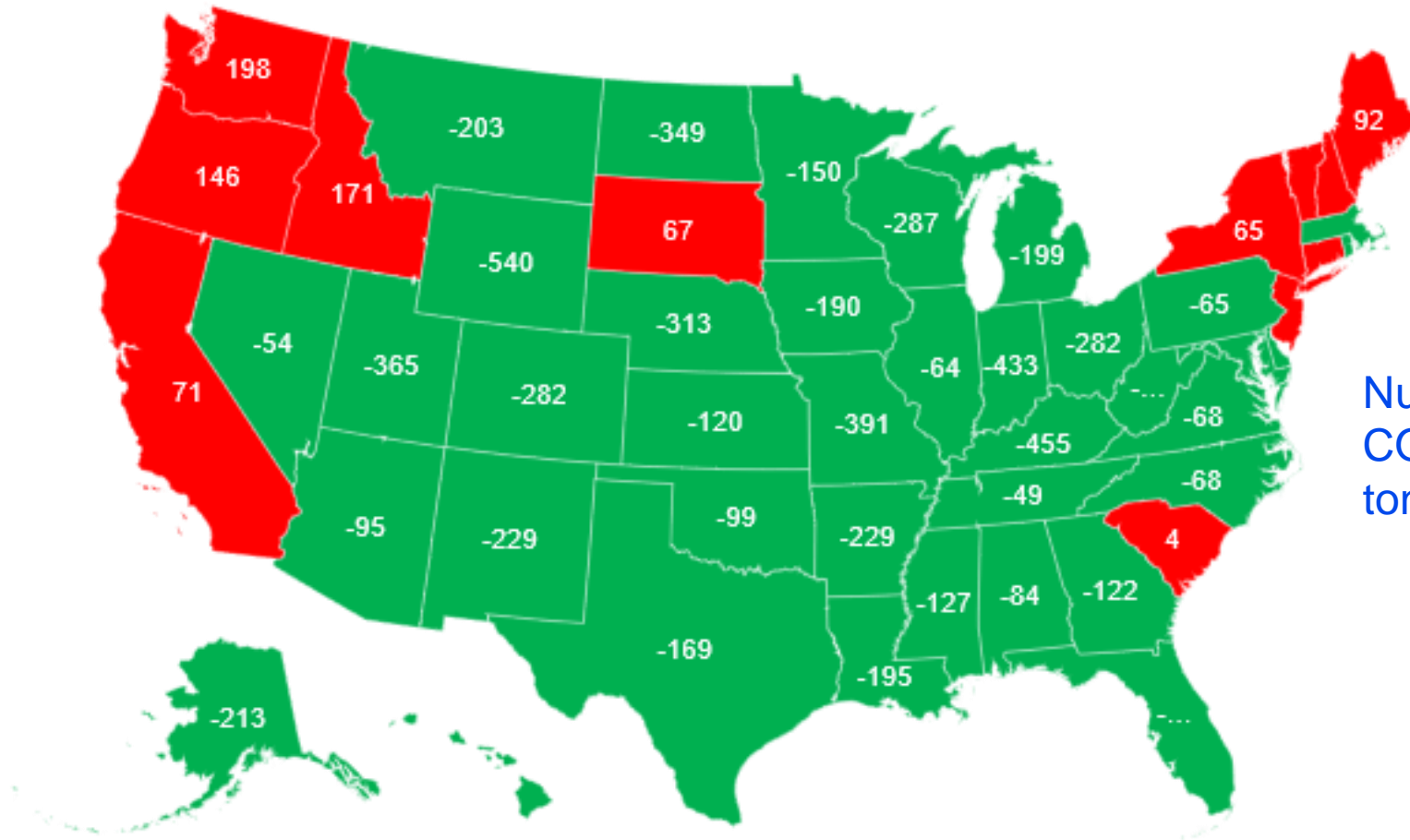
Case	Detail
Case I	Comparison of conventional propane vehicle vs. MDEV
Case II	Comparison of renewable propane vehicle vs. MDEV
Case III	Comparison of propane/renewable DME blend (80%-20% by mass) vehicle vs. MDEV
Case IV	Comparison of renewable propane/renewable DME blend (80%-20% by mass) vehicle vs. MDEV
Case V	Comparison of renewable propane/renewable DME blend (80%-20% by mass) vehicle vs. MDEV (Decarbonized electric grid scenario)

- Renewable fuel and components production CIs assumed the same as status-quo even under decarbonized electric grid scenario. In reality, the CI of renewable fuels and production CIs will be lower due to cleaner electricity. Calculation of these are out-of-scope
- Propane vehicle fuel economy has been kept the same as status-quo even under decarbonized electric grid scenario. In reality, the fuel economy will improve significantly due to evolution of engine technologies (~25 years from now)

## PROPANE VS. FULL ELECTRIC

Case-I:  $\Delta\text{CO}_2_{\text{eq}}$  for One Truck:

Green - Propane is Better, Red – MDEV is better



Numbers represent  $\Delta\text{LC}$  CO2 emissions in US tons per MD vehicle

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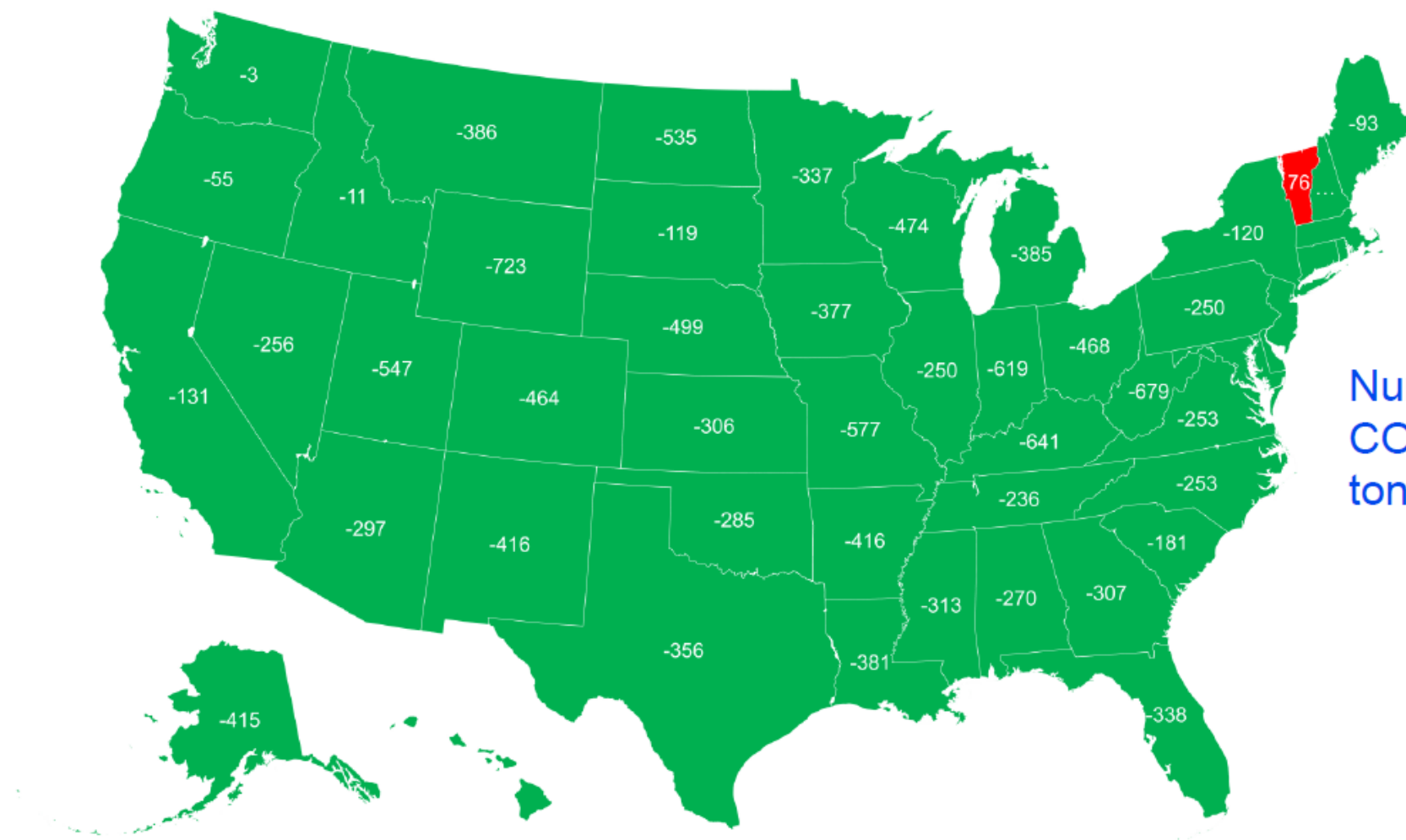
Today, Propane is a cleaner solution for 38 states and DC



## RENEWABLE PROPANE VS. FULL ELECTRIC

Case-II:  $\Delta\text{CO2}_{\text{eq}}$  for One Truck:

Green – R-Propane is Better, Red – MDEV is better



Numbers represent  $\Delta\text{LC}$  CO2 emissions in US tons per MD vehicle

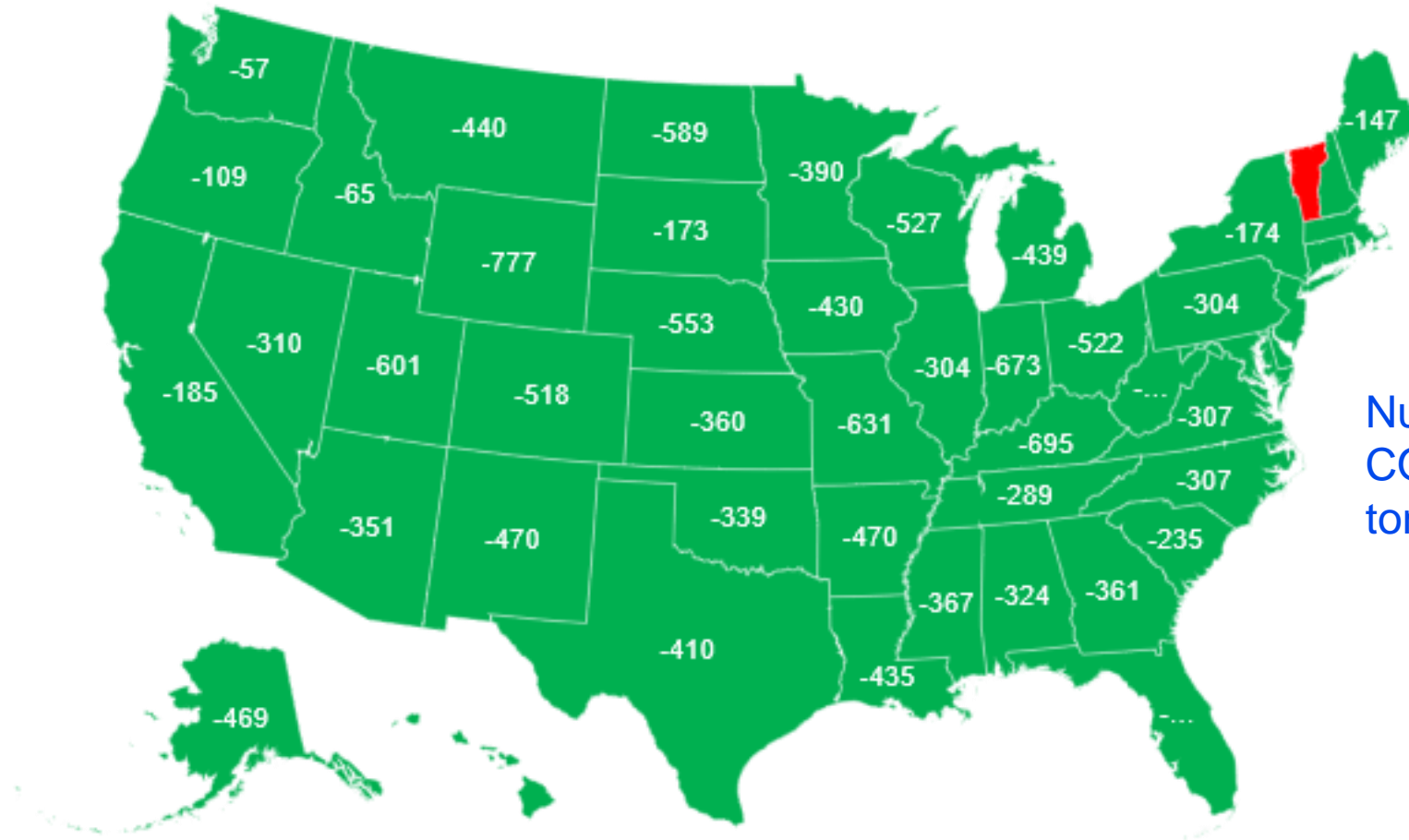
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Today, Renewable Propane is a cleaner solution for all states (and DC) but Vermont

## PROPANE/RENEWABLE DME BLEND VS. FULL ELECTRIC

Case-III:  $\Delta\text{CO2}_{\text{eq}}$  for One Truck:

Green – Propane/R-DME is Better, Red – MDEV is better



Numbers represent  $\Delta\text{LC}$  CO2 emissions in US tons per MD vehicle

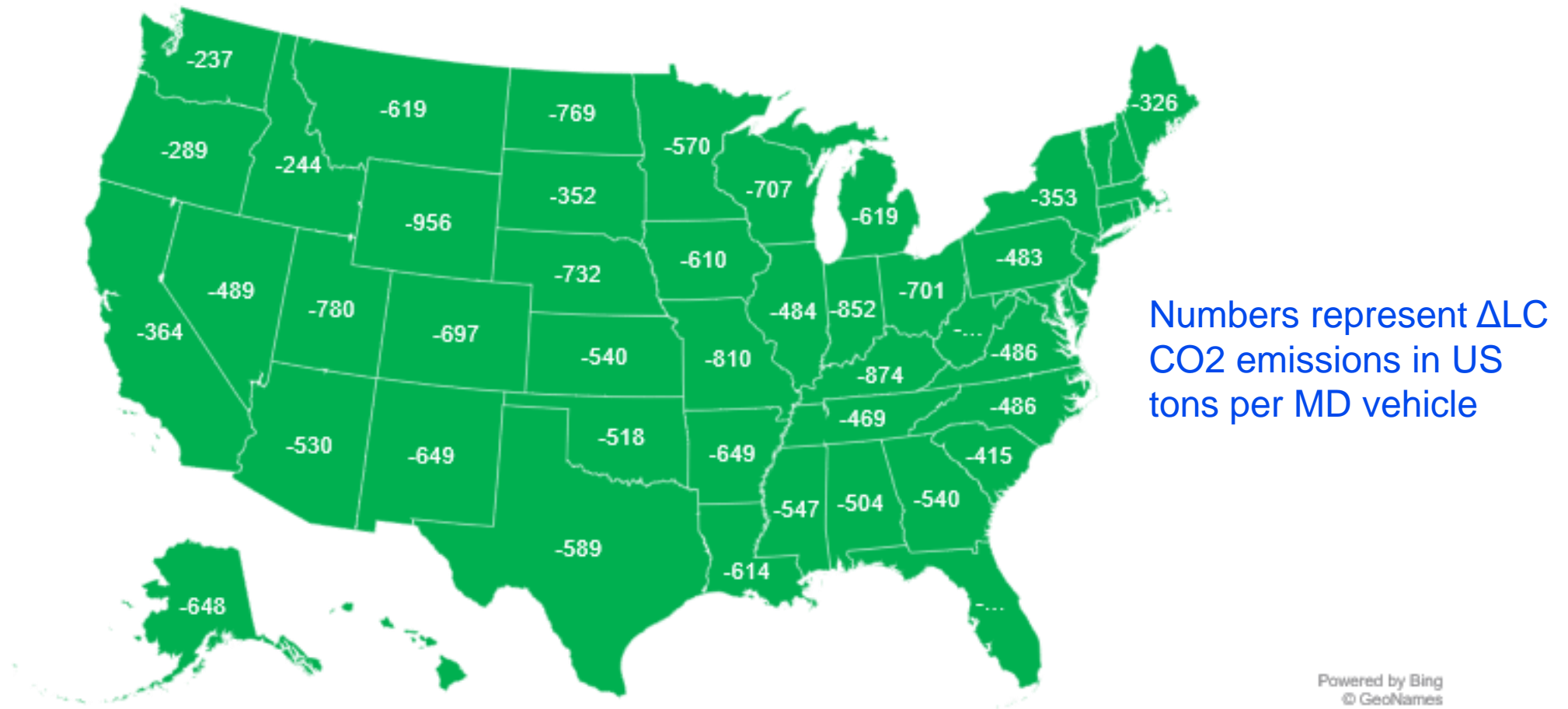
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Today, Propane/R-DME blend is a cleaner solution for all states (and DC) but Vermont

## RENEWABLE PROPANE/RENEWABLE DME BLEND VS. FULL ELECTRIC

Case-IV:  $\Delta\text{CO2}_{\text{eq}}$  for One Truck:

Green – R-Propane/R-DME is Better



**Today, R-Propane/R-DME blend is a cleaner solution for all states and DC**



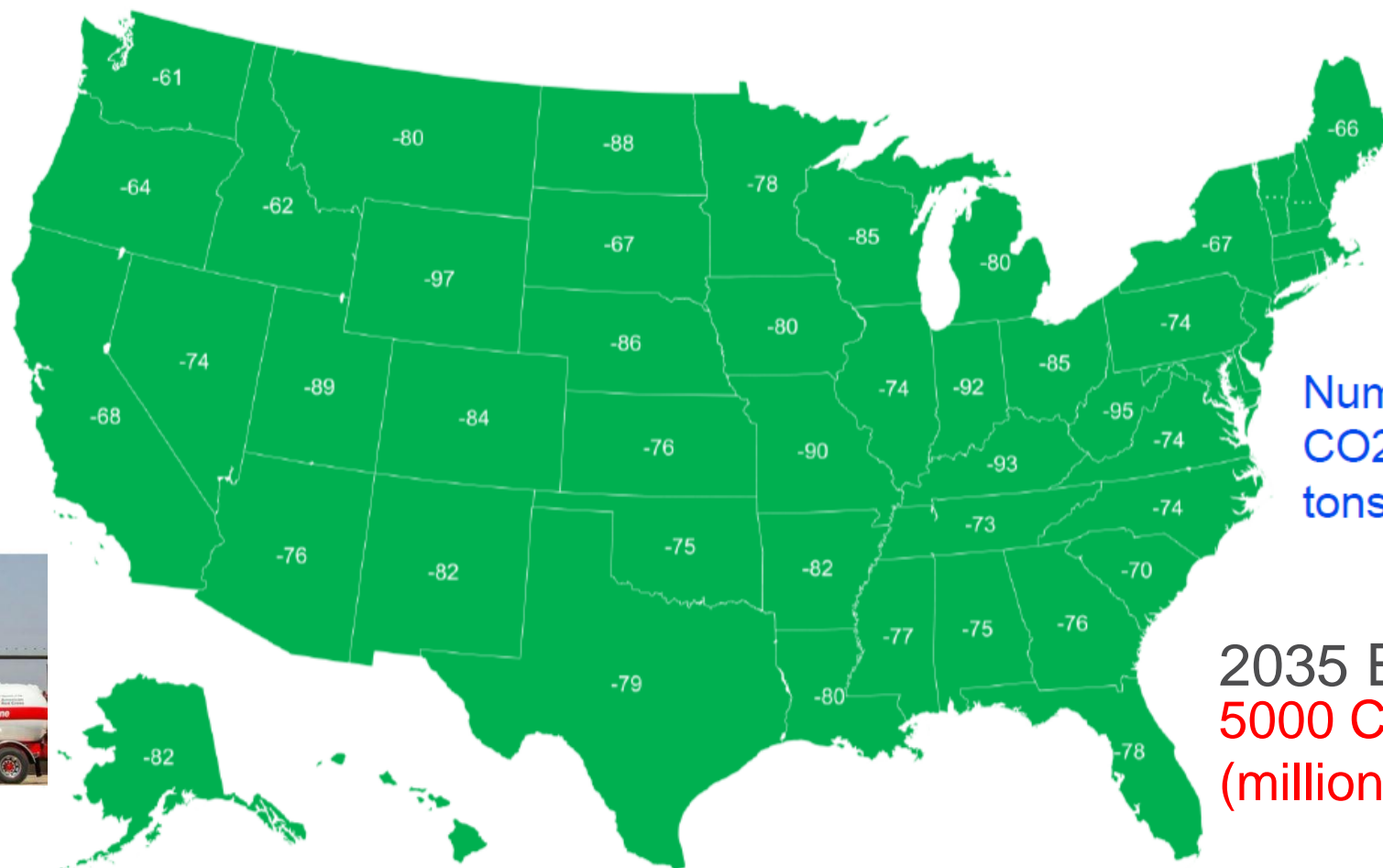
# RENEWABLE PROPANE/RENEWABLE DME BLEND VS. FULL ELECTRIC

## Case-V – Utopian Future - $\Delta\text{CO2}_{\text{eq}}$ for One Truck:

### Green – R-Propane/R-DME is Better



OBERON + SUBURBAN: MOVING RDME TOWARDS COMMERCIALIZATION



Numbers represent  $\Delta\text{LC}$  CO2 emissions in US tons per MD vehicle

2035 Electric Grid  
5000 Cycles  
(million-mile battery)

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Even with decarbonized electric grid, renewable propane/renewable DME blend vehicle is a cleaner solution than MDEV for all states and DC

# References

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- Hawkins et al. (2012). Comparative Environmental Life Cycle Assessment of Conventional and Electric Vehicles, Journal of Industrial Ecology
- Effects of battery manufacturing on electric vehicle life-cycle greenhouse gas emissions, ICCT Briefing (2018)
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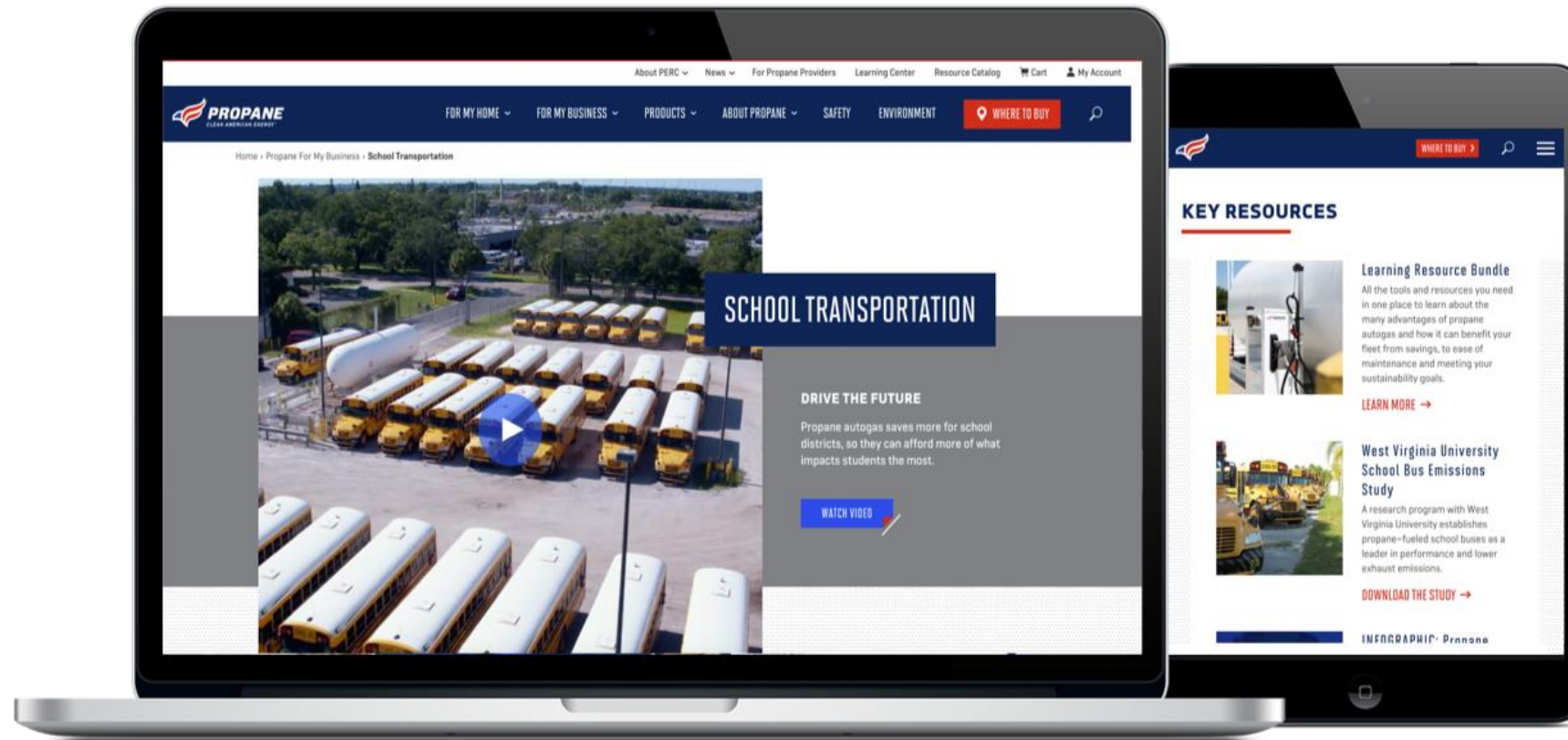
# Benefits of Propane/Renewable Propane

- Cost Effectiveness
  - MD Propane averages 15% of vehicle cost
  - MD EV averages 300% of vehicle cost
- Payload
  - MD Propane –no loss of payload
  - MD EV – heavy battery weight diminishes payload capacity
- CO2 Greenhouse Gas
  - MD Propane produces less carbon in 38 states than EV today
  - MD Renewable Propane best blend produces less carbon in all states than EV's best grid in 2035





<https://propane.com/for-my-business/school-transportation/>



# **STEVE WHALEY**

***DIRECTOR OF AUTOGAS BUSINESS DEVELOPMENT***

**PROPANE EDUCATION & RESEARCH COUNCIL**

***STEPHEN.WHALEY@PROPANE.COM***

***864-606-2290***

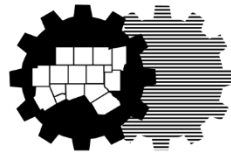
# Matt McDonald

PERC

Director of Off-road Business Development  
Mowers



**Dallas-Fort Worth  
CLEAN CITIES**



**North Central Texas  
Council of Governments**



**PROPANE  
COUNCIL  
OF TEXAS**





# Propane Mowers Can Do That

---



# Current Challenges for Landscape Contractors

1. Cost of doing business.
  - Daily operating costs.
  - Seasonal labor issues.
  - Expensive equipment.
  - Oversaturated markets driving down margins.
2. Emissions restrictions.
  - Either requested or required by customer.
3. Downtime is a revenue killer.

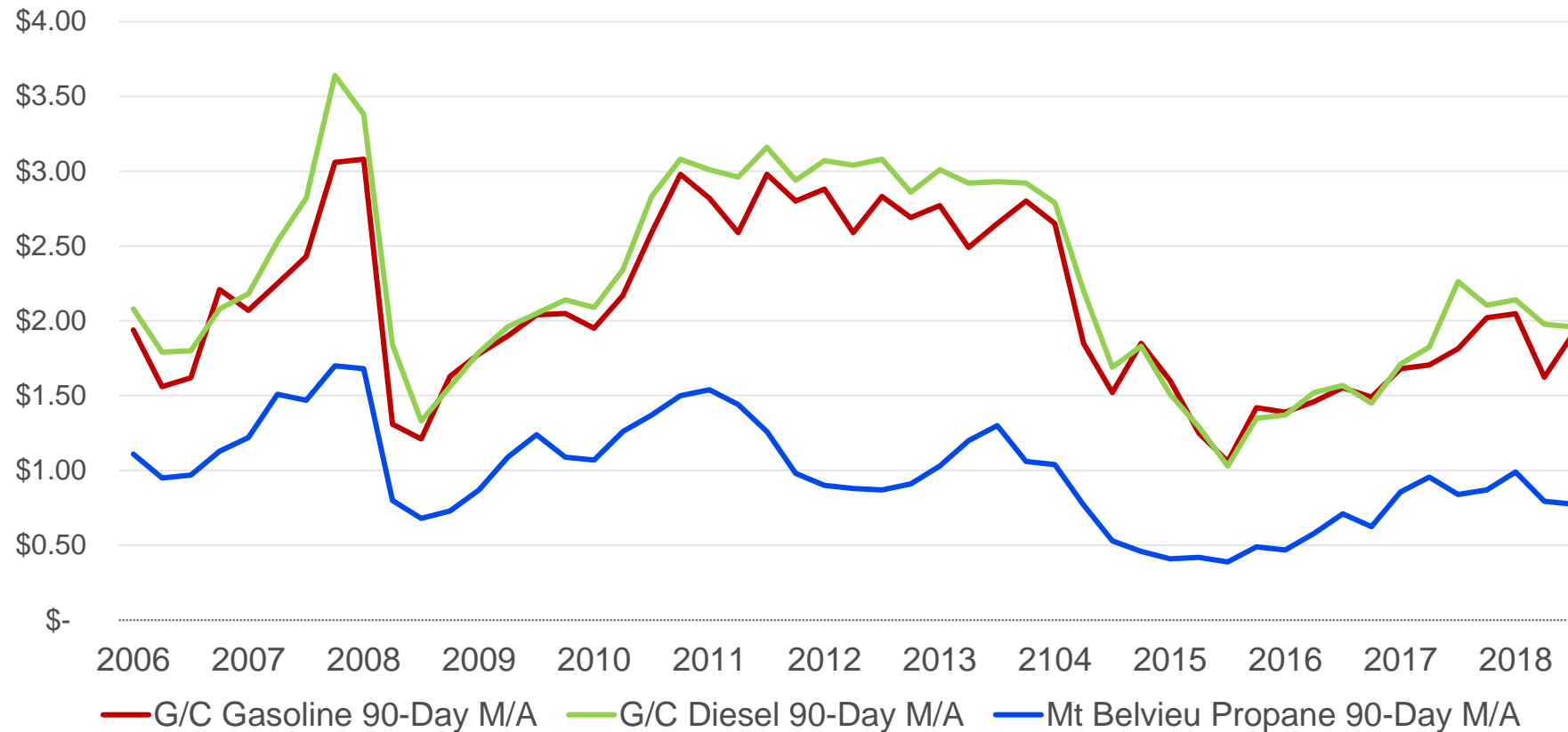


# How Propane Helps Commercial Landscapers

1. Reduces fuel costs.
  - Between 30-50% savings over gasoline & diesel.
2. Improved emissions profile.
  - Qualify for more bids.
  - Ability to operate on more days (Ozone Action Days).
3. Increase in productivity.
  - Faster refueling & on-site refueling options.

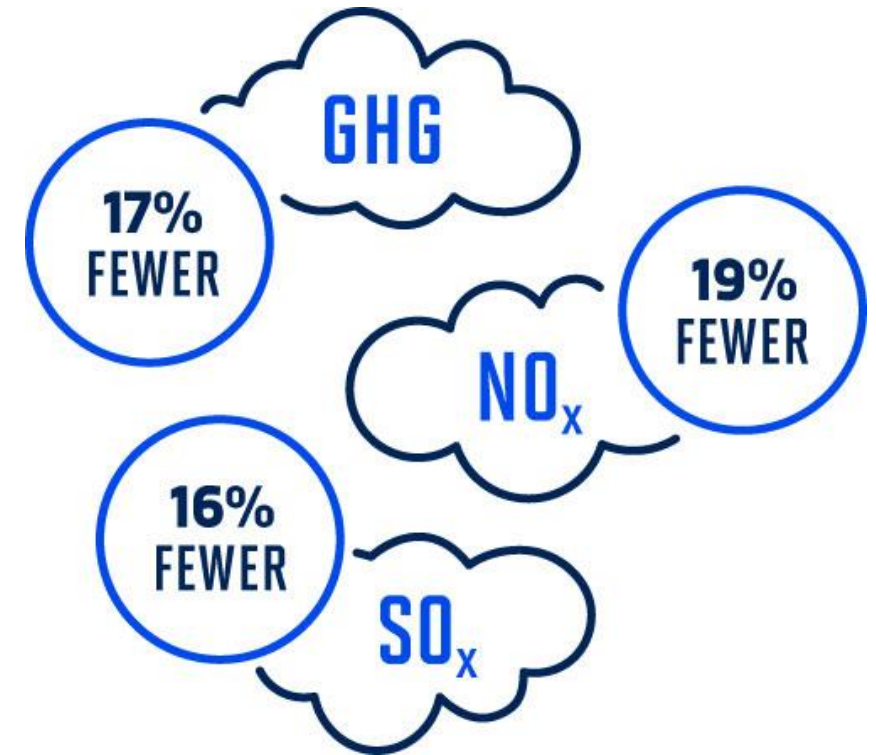


# US Energy Price Comparison 2006 – 2018



# Reduced Emissions

1. Emissions matter to the contractor and their customers.
  - Could even be *required* by a bid.
2. Being “green” enables contractors to reach new or niche audiences.
  - Schools, municipalities, etc.
3. Contractors can leverage propane’s low-emissions status in their marketing efforts.



COMPARED WITH GASOLINE

# Increased Productivity w/ Refueling



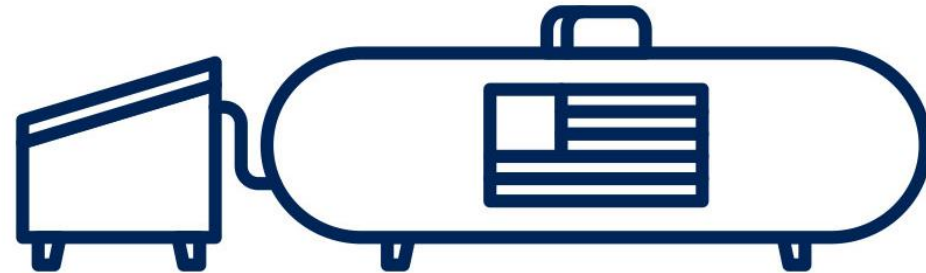
Less time spent refueling or dealing with fuel-related issues and more time spent mowing.



# Increased Productivity w/ Refueling

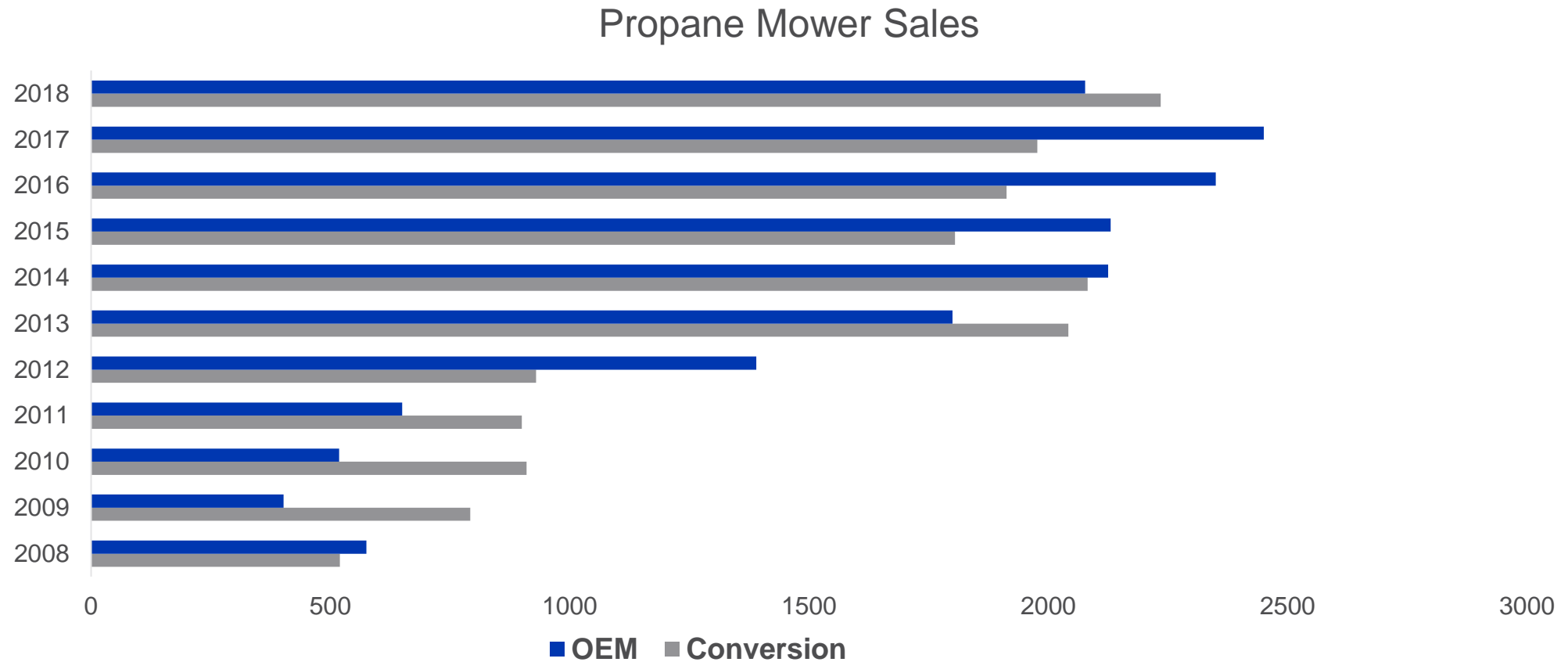


Best for small mowers fleets  
(1-10 mowers)



Best for larger mower fleets  
(10+ mowers)

# A Growing Market



# Propane Options from Brands Contractors Prefer

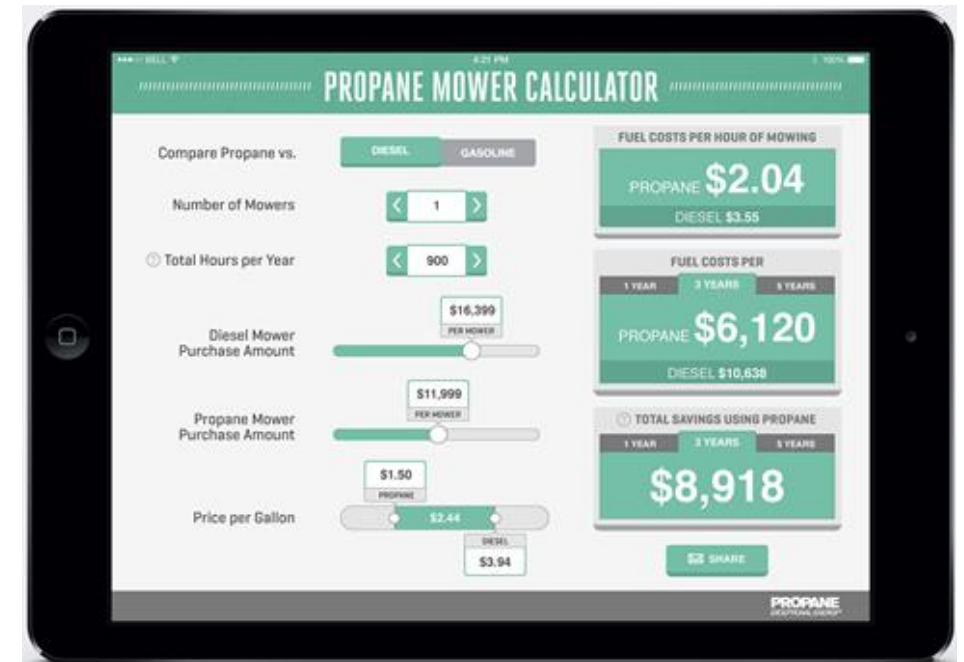




# Calculate Your Savings

- Input variables specific to your fleet to determine the amount of savings propane equipment can provide your business.
- Available in tablet, smartphone, and desktop applications.

**[Propane.com/Mower-Calculator](https://Propane.com/Mower-Calculator)**



# Need Help Finding an Equipment Dealer or Conversion Specialist?

- The only locator of its kind, directing contractors who want to buy propane equipment to the dealers who sell it.


**Propane.com/Where-To-Buy/  
Find-Equipment-Dealer**

Home > Where to Buy > Find an Equipment Dealer

## FIND AN EQUIPMENT DEALER

20 miles SEARCH

[Trying to find a Propane Supplier? →](#)



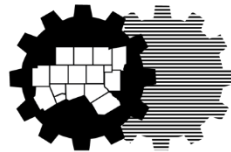
Showing 0 Results

# Tom Hopkins

Roush CleanTech  
Business Development Manager  
Technology and School Buses



Dallas-Fort Worth  
CLEAN CITIES



North Central Texas  
Council of Governments



PROPANE  
COUNCIL  
OF TEXAS





# Dallas / Fort Worth Autogas Answers

































**BLUE BIRD®**

**ROUSH®**  
**C L E A N T E C H**



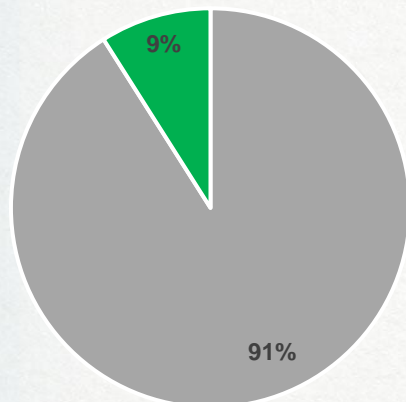


# Fleet Fuel Options

					
Ease of Adoption					
Energy Independence					
NOx Emissions					
Fuel Infrastructure					
Cost of Ownership					
Range					
Maintenance					
Scalable					
Cold Weather Operation					

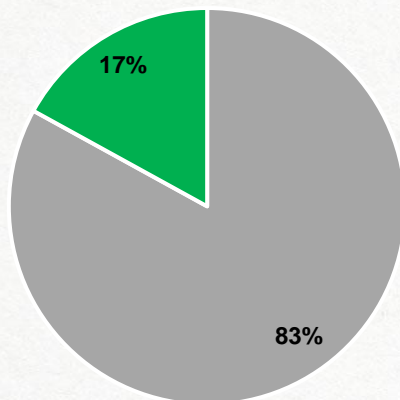
# Disruptive Growth in Alternative Fuels

FY 2012



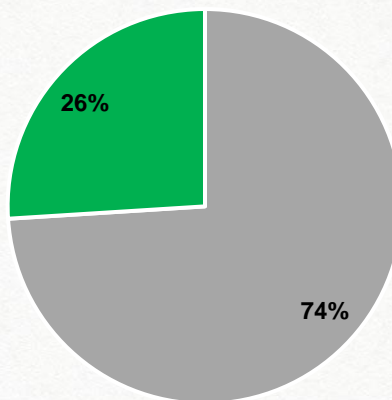
9%

FY 2014



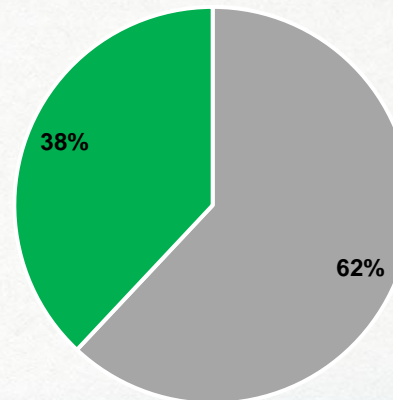
17%

FY 2016



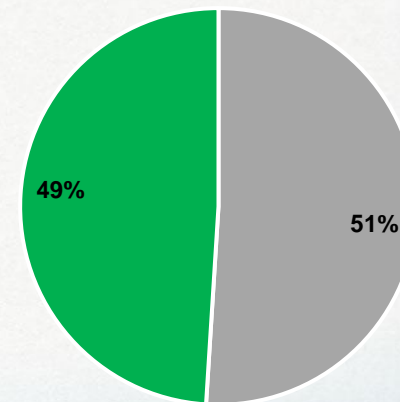
26%

FY 2018



38%

FY 2019



49%





OVER

**16,000**

SCHOOL BUSES  
ON THE ROAD

ACCUMULATED  
OVER

**500**

MILLION MILES

OVER

**950**

SCHOOL  
DISTRICTS





## 38 School Districts

- 1146 Propane Buses





## Model Year

2021

## Engine Size

7.3L V-8 (2V) Ford Engine with exclusive ROUSH  
CleanTech Propane Fuel System

## Applications

169" / 189" / 217" / 238" / 252" / 273" / 280"  
wheelbase configurations

6-speed automatic transmission

## Propane / Gas Fuel Tank Capacity

Short: 47 gallons (usable)

Standard: 67 gallons (usable) / 60 gallons

Extended: 93 gallons (usable) / 100 gallons

## Technical Specifications

EPA and CARB approved.

GVWR: 33,000 lbs.

Up to 77 passengers

## Order Availability

Blue Bird dealers





# Micro Bird Type – A

## Model Years

2021

## Engine Size

7.3L V8 PFI

## Applications

158" wheelbase

6-speed automatic transmission.

## Fuel Tank Capacity

Aft-axle: 41 gallons (usable)

## Technical Specifications

EPA and CARB approved.

GVWR: > 14,000

Requires "91G" gaseous fuels prep. package.

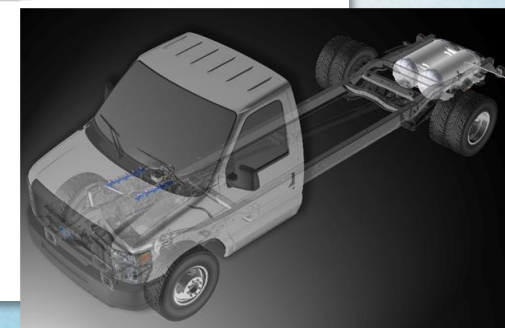
## Seating Capacity

Up to 30 passengers

## Order Availability

July 2020

## Ford E-450 Dual Rear Wheel





# 7.3L ENGINE

# Ford 7.3L V8

Meaner



Leaner

Cleaner



# 7.3L Engine Stats

**Engine RPM**



**Idle: 680 / Max: 4,050**

**7.3**

**HP: 350 / Torque: 468**

**ft-lbs.**

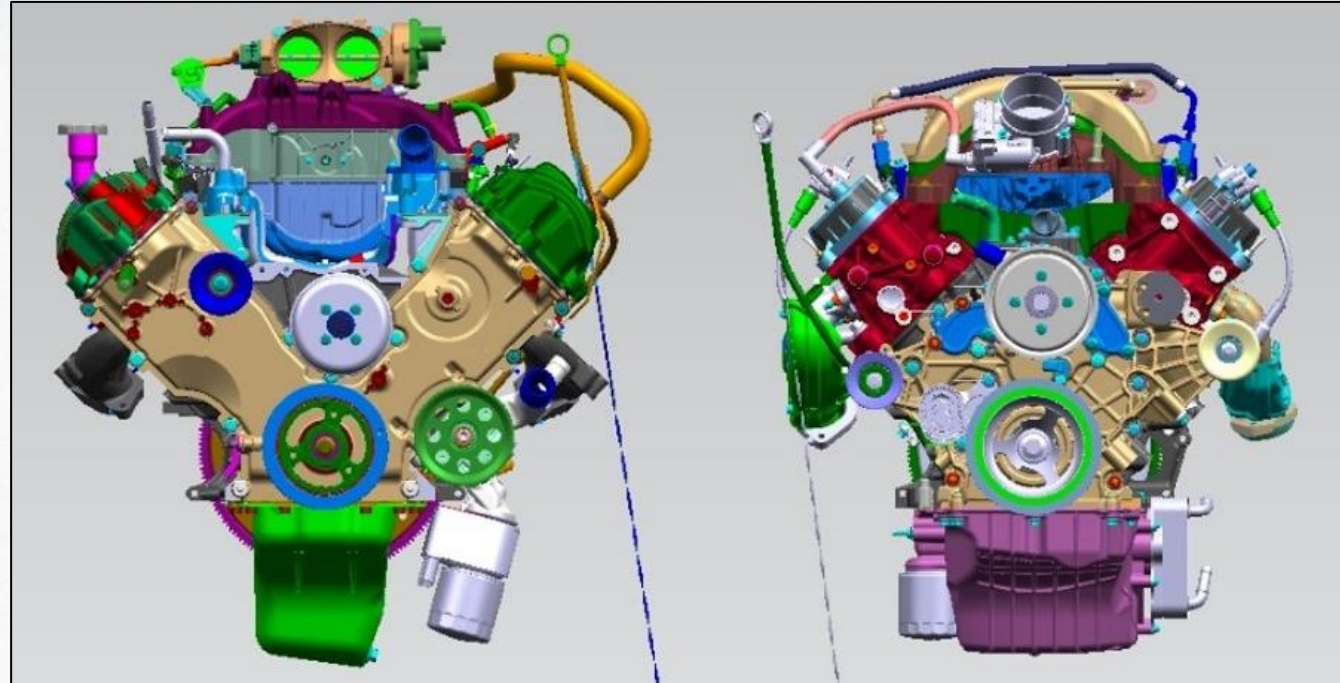
**@ 3,900 RPM**

**Design**

**Compression**



# Dimensional Comparison



	6.8L 3V Triton	7.3L 2V Godzilla
Height	915 mm	835 mm
Width	837 mm	757 mm
Length	755 mm	766 mm

# Service & Parts Comparison

6.8L V10		7.3L V8
5,000	Oil Change Interval	5,000
60,000	Spark Plug Interval	60,000
7 Quarts	Oil Capacity	8 Quarts
Motorcraft 5w30 Blend	Oil Type	Motorcraft 5w30 Blend
Motorcraft SP509	Spark Plug	Motorcraft SP551
Motorcraft FL820S	Oil Filter	Motorcraft FL820S
6R140	Transmission	6R140

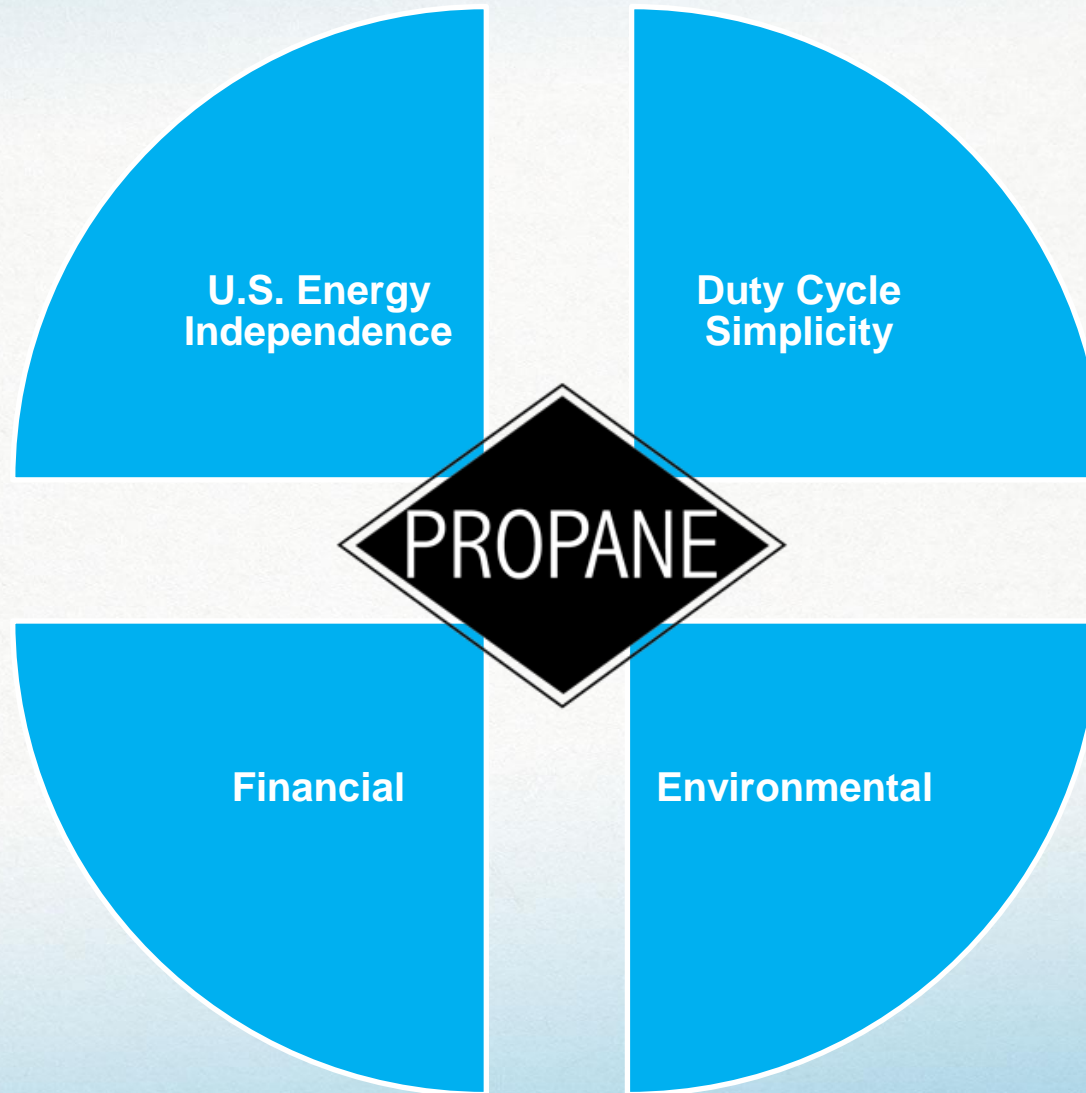


# 7.3L Scale

- Class 2 – 7
- High Volume
  - >600 / day
  - 6X Competition
- Wide Vocational Usage
  - Parts
  - Support
  - Experience



# Buyer Motivations





# COST & COMPLEXITY



# Preventative Maintenance



---

Ford V10  
Gas and Propane  
7 Quarts



---

Various Engines  
Diesel  
17 – 30 Quarts



# Engine Components: Diesel

## Cummins ISB 6.7L

Part	Quantity	Price	Total
NOx Sensor	1	\$480.00	\$480.00
NOx Sensor	1	\$560.00	\$560.00
Pressure Sensor	1	\$140.00	\$140.00
Doser Injector	1	\$290.00	\$290.00
Catalyst Assembly w/ DPF	1	\$10,554.11	\$10,554.11
Temperature Sensor	1	\$78.90	\$78.90
Temperature Sensor	2	\$84.90	\$169.80
Turbo	1	\$2,731.20	\$2,731.20
Injector	6	\$755.56	\$4,533.36
EGR Valve	1	\$590.15	\$590.15
EGR Cooler	1	\$923.72	\$923.72
			<b>Total \$21,051.24</b>



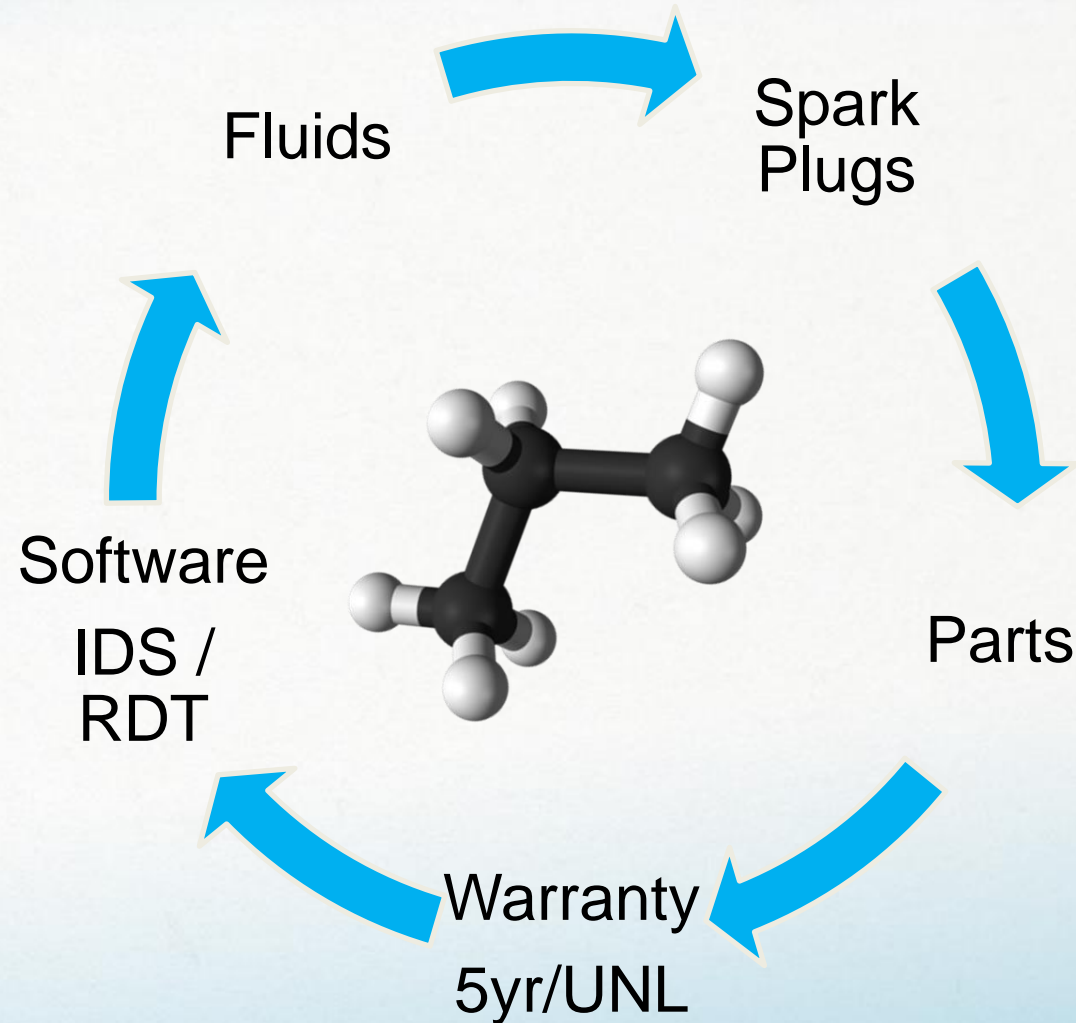
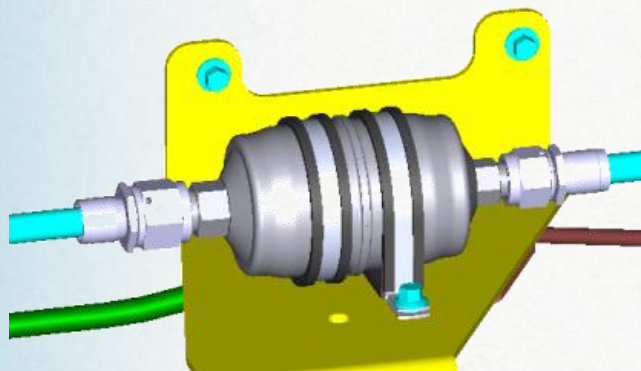
# Engine Components: Ford Roush

## Ford 6.8L V10

Part	Quantity	Price	Total	Total \$3,645.94
PCV Hoses (2)	1	\$43.68	\$43.68	
Vapor Management Valve	1	\$65.00	\$65.00	
Gasket	1	\$5.99	\$5.99	
Injector Assembly	10	\$215.00	\$2,150.00	
Converter Assembly	1	\$910.00	\$910.00	
Spark Plugs	10	\$7.08	\$70.80	
O2 Sensors (all 3)	1	\$102.57	\$102.57	
Coil Packs	10	\$29.79	\$297.90	

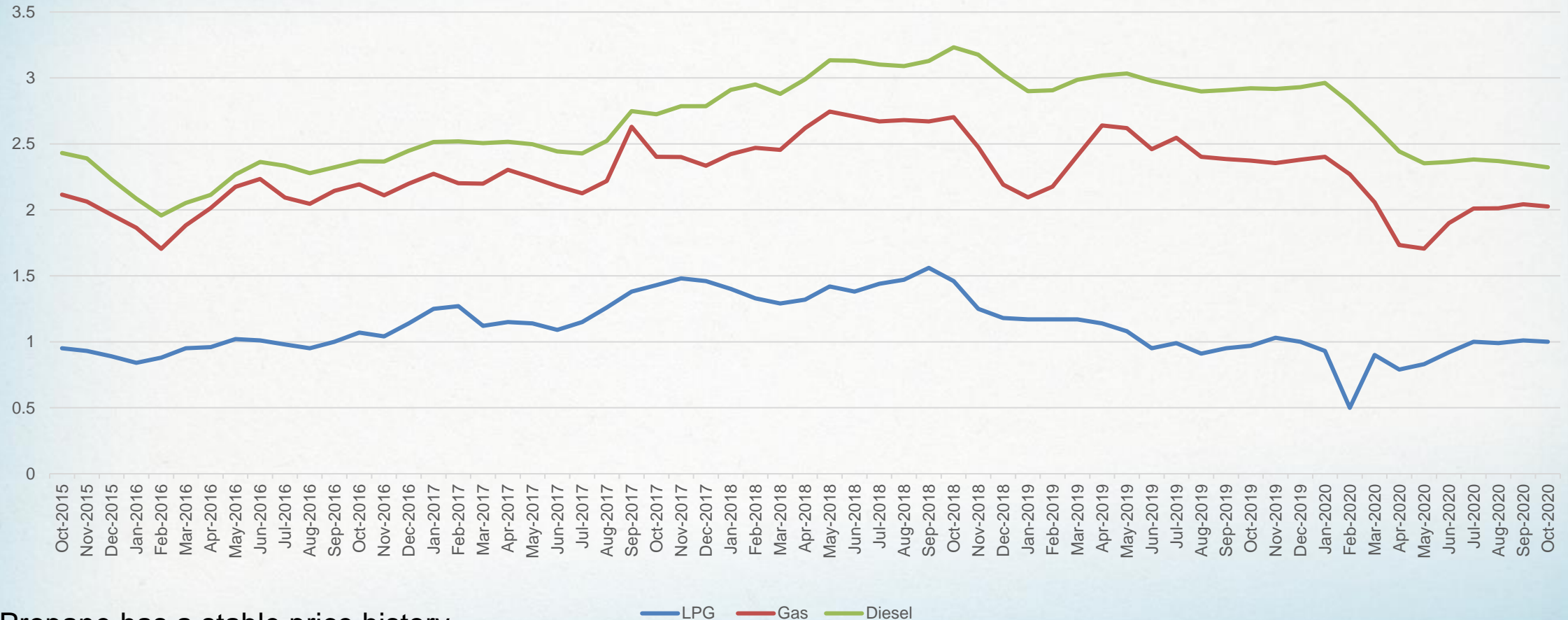
## Propane Maintenance – Common

Fuel filtration is the only  
unique maintenance item



# Fuel Component

5 Year Look



- Propane has a stable price history
- Price lock contracting for multiple years
- Eligible for rebates, bringing District dollars back



# Total Cost of Ownership



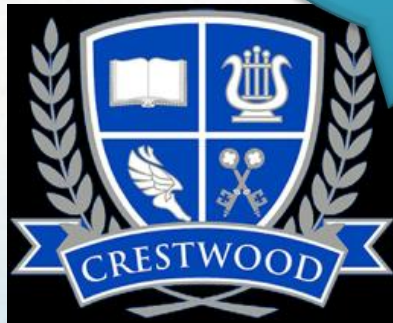
<b>ROUSH</b> CLEANTECH		 PROPANE	 Rebates	 GAS				
<b>FUEL</b>							Propane Fuel Price <b>\$1.10</b>	Diesel Fuel Price <b>\$2.47</b>
Annual Miles per Bus	15,000			15,000	15,000	15,000	Gasoline Fuel Price <b>\$2.17</b>	Electricity kWh <b>\$0.13</b>
Years Operated	15			15	15	15		
Total Miles Lifetime Miles per Bus	225,000			225,000	225,000	225,000		
Fuel Economy (mpg)	4.50			6.00	7.50	1.40		
Gallons Used Annually per Bus	3,333			2,500	2,000.00	558		
Gallons Used Total per Bus	50,000			37,500	30,000.00	8,365		
Fuel Price / Gallon	\$1.10	\$0.74		\$2.17	\$2.47	\$4.90		
<b>PREVENTATIVE MAINTENANCE</b>							Propane MPG <b>4.50</b>	Gasoline MPG <b>6.00</b>
Oil Interval	5,000			5,000	7,000		Diesel MPG <b>7.50</b>	EV Efficiency kWh/Mile <b>1.40</b>
Oil Capacity (Quarts)	7			7	21			
Oil Filter Cost	\$5.00			\$5.00	\$9.36			
Cost per Oil Change	\$22.50			\$22.50	\$61.86			
Lifetime Oil Change Total Cost	\$1,012.50			\$1,012.50	\$1,988.36			
DEF Lifetime Cost					\$2,268			
Fuel Filters Change Interval	50,000				15,000			
Fuel Filters Cost	\$160				\$12.99			
Total Filters Changes	4				15			
Fuel Filter Cost Lifetime	\$640				\$194.85			
<b>Total Cost</b>		<b>Propane</b>	<b>Propane</b>	<b>Gasoline</b>	<b>Diesel</b>	<b>EV</b>		
Lifetime Cost	\$161,653	\$143,653		\$180,388	\$181,551.21	\$195,000.00	Years Operated <b>15</b>	Gasoline Bus Price <b>\$98,000</b>
Lifetime Savings	\$19,899	\$37,899		\$1,164		(\$13,449)	Annual Miles per Bus <b>15,000</b>	Diesel Bus Price <b>\$103,000</b>
Cost per Mile	\$0.72	\$0.64		\$0.80	\$0.81	\$0.87	Propane Bus Price <b>\$105,000.00</b>	EV Bus Price <b>\$325,000.00</b>
			<b>Grants</b>			<b>Grants</b>	LPG Fuel Rebate <b>\$0.36</b>	EV Bus Grant <b>\$130,000.00</b>
							LPG Bus Grant <b>\$0.00</b>	Diesel Bus Grant <b>\$0.00</b>

# Real World Savings

“15 Cents per  
Mile Savings  
on Average”



“34 Cents per  
Mile Savings  
on Average”



“Over \$7,000  
per Bus  
Savings in  
First Year”



“80% Lower  
Fuel Costs”





# ENVIRONMENT & HEALTH



# ROUSH 7.3L Propane - Emissions

Emission Constituent	Blue Bird Vision 7.3 LPG
NOx (Nitrogen Oxides)	0.021
HCHO (Formaldehyde)	0.00
PM (Particulate Matter)	0.002
NMHC (Non-Methane Hydrocarbons)	.051
CO (Carbon Monoxide)	5.85
Greenhouse Gas Emissions	
GHG Carbon Dioxide (CO <sub>2</sub> )	545
GHG Methane (CH <sub>4</sub> )	0.032
GHG Nitrous Oxide (N <sub>2</sub> O)	0.02



- Approximate average: 70% cleaner than standards

## LOW SCHOOL BUS EMISSIONS LINKED TO IMPROVED ACADEMIC PERFORMANCE



A first-of-its-kind 2019 study released by Georgia State University links low emission on school buses to improved academic performance.

The study found students who rode to school in alternative fuel buses like propane autogas had higher test scores in math and English compared to students who rode to school in diesel buses.



# SAFETY



# SAFETY = #1 Priority

## Crash Testing

- ✓ Blue Bird is certified to Canadian Motor Vehicle Safety Standard **CMVSS 301.1** testing protocol, higher than US
- ✓ 4,000 lbs. @ 30 MPH
- ✓ Angled side and rear impact



## Other Features

- ✓ **Colorado Rack Test and the Kentucky Pole Test**—Blue Bird is the only school bus OEM that has both tests as an engineered specification standard on all buses
  - *Colorado Rack Test: Ensures that the structural integrity of the bus remains intact in the event of a rollover accident*
  - *Kentucky Pole Test: Ensures the strength of the school bus roof in case of a pole, or another sharp object impacts the bus during a rollover*

# Propane Safety

- Propane is considered as safe as any conventional engine fuel.
- Fuel tanks are 20 times more puncture resistant than gasoline.
  - Ductile steel tanks about 1/8" thick (varies slightly by tank diameter).
  - All fuel tanks are leak checked before installation.
- Colorless and odorless.
  - Ethyl mercaptan added for leak detection.





# Shut-off Locations

## Fuel Rail Pressure Control Module

- Supply solenoid on the FRPCM
- Check valve on FRPCM return line

## Tank Check Valves

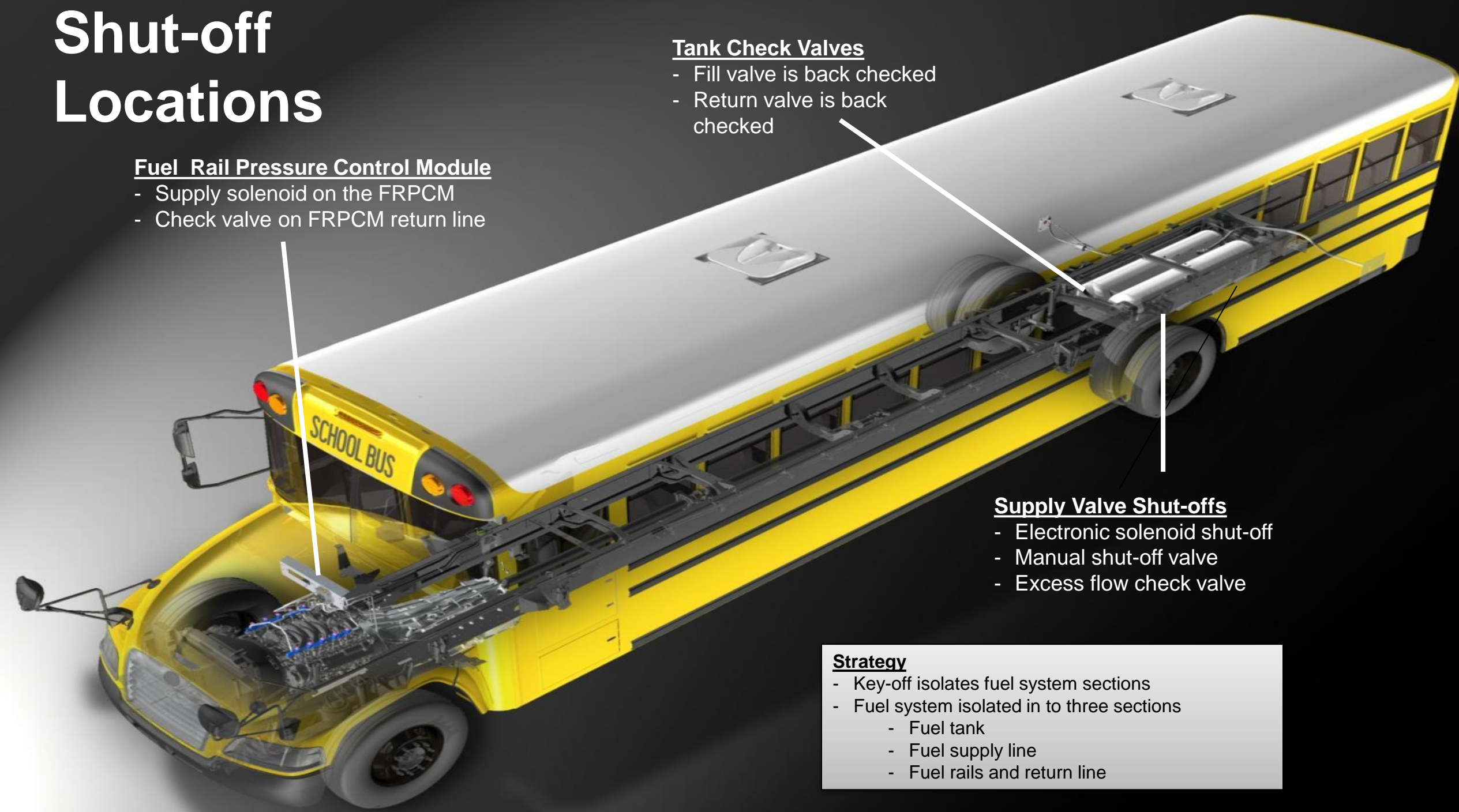
- Fill valve is back checked
- Return valve is back checked

## Supply Valve Shut-offs

- Electronic solenoid shut-off
- Manual shut-off valve
- Excess flow check valve

## Strategy

- Key-off isolates fuel system sections
- Fuel system isolated in to three sections
  - Fuel tank
  - Fuel supply line
  - Fuel rails and return line







# CUSTOMER SUCCESS

# Customer Success Structure



**Customer  
Support**



**Technical  
Support**



**Field Service**



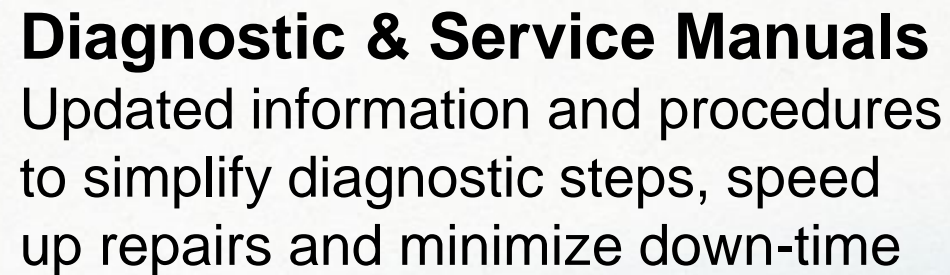
**Technical  
Publications**



**Training**



**Warranty +  
Service Parts**





# Web-Based Training

- Propane Properties and Safety
- Fuel System Components
- System Diagnostics
- Basic Warranty Information
- Technician Tip Videos



# ROUSH CleanTech Factory Workshop

Were the facilities and training equipment appropriate for the training	How useful to your job was the information your learned	Fleets Only: Based on the training session, would you recommend Roush CleanTech Vehicles for your fleet's future purchases	Public Service Centers Only: Based on this session, how likely are you to accept future Roush CleanTech repairs	Overall, was the training session valuable and worth your time
4.87	4.87	4.76	4.93	4.93



“Tons of info presented in a way that made sense. Bugged vehicle sessions were great”

“Fantastic Workshop, overall. Trainers did an awesome job. They were knowledgable and professional. The hospitality was great as well. Thank you!”



- ✓ Simple and Robust Design
- ✓ No Duty Cycle Compromise
- ✓ Economical Operation
- ✓ Safe by Composition and Design
- ✓ Environmentally Responsible from Well to Wheels







**THANK YOU!**

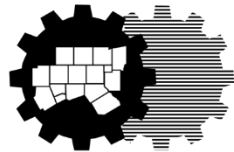
**Tom Hopkins**  
ROUSH CleanTech  
**(734) 679-5704**  
Tom.Hopkins@roush.com

# Heather Ball

Propane Council of Texas (ProCOT)  
Grants Advisor  
Current Funding Opportunities



**Dallas-Fort Worth  
CLEAN CITIES**



**North Central Texas  
Council of Governments**



**PROPANE  
COUNCIL  
OF TEXAS**

# Incentives for Propane Vehicles





# Propane Council of Texas

The Propane Council of Texas (ProCOT) is a non-profit 501(c) 3 dedicated to propane education and marketing.

The Council is the state arm of the Propane Education & Research Council (PERC) and we are here as a resource for fleets to help connect the dots here in Texas:

- ➡ Find a fuel provider in Texas
- ➡ Find a propane vehicle or aftermarket conversion kit
- ➡ Help finding conversion centers in Texas
- ➡ Providing complimentary grant writing services



# Don't Wait to Apply for Grant Funding



A PROGRAM OF TCEQ

## Texas Emissions Reduction Plan

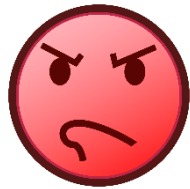


# Texas State Revenue Forecast



## Good News:

Legislature created the Texas Emission Reduction Plan Trust Fund



## Bad News:

Comptroller Glenn Hegar Projects a Fiscal 2021 Ending Shortfall of \$4.6 Billion in Revised Revenue Estimate





# Deadlines for TERP Applications

## January 2021

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
53					Light Duty Deadline	<b>1</b> New Year's Day	<b>2</b>
1	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
2	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>
3	<b>17</b>	<b>18</b> ML King Jr. Day	<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>	<b>23</b>
4	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>
5	<b>31</b>			VW Deadline			

## February 2021

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
5		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
6	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>
7	<b>14</b> Valentine's Day	<b>15</b> Presidents' Day	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
8	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>
9	<b>28</b>					Natural Gas Vehicle Deadline	
							<a href="http://wheniscalendars.com">wheniscalendars.com</a>



# Light Duty Vehicle Grant



A PROGRAM OF TCEQ

\$5,000 per vehicle for new light-duty natural gas or propane vehicles

\$2,500 for electric vehicles.



# Volkswagen Grant



Up to 50% of the cost for replacement of old diesel refuse and sweeper trucks for public entities





# Natural Gas Vehicle Grant



Replacement of Diesel and  
Gasoline Vehicles greater  
than 8,501



# Governmental Alternative Fuel Fleet Program



New natural gas, liquefied natural gas, liquefied petroleum gas, hydrogen fuel cells, or electricity vehicles and infrastructure.



# NCTCOG – Available Replacement Programs

Funding Agency	Program	Eligible Applicants	Eligible Activities	Old Vehicle Criteria	Funding Levels	Deadline
NCTCOG	<a href="#">Clean Fleets North Texas (CFNT) 2020</a>	Local governments or private companies that contract with local governments	Replace heavy-duty diesel vehicles and equipment	<b>Fuel:</b> Diesel <b>Model Year:</b> 1996 – 2006 (up to 2009 if replacing with electric) <b>GVWR:</b> >16,001 lbs.	<b>Up to 45%</b> if electric <b>Up to 35%</b> if new engine is certified to CARB Low NOx standards <b>Up to 25%</b> for all others	First deadline January 8, 2021 with rolling deadlines every three months until October 8, 2021
	<a href="#">North Texas Emissions Reduction Project (NTERP) 2020</a>	Private entities				



# Updated Grant Chart



Funding Opportunities for Alternative Fuel Vehicles and Equipment in Texas					
The chart provides an overview of major funding opportunities for natural gas and propane vehicles in Texas. For more detailed information on the incentives, contact Heather Ball at 512-484-8535 or <a href="mailto:heather@txng.org">heather@txng.org</a>					
Funding Type	Est. Opening Date(s)/Amt Avail	Funding for	Old Vehicle Destroyed	Who can receive funding?	Eligible Counties
<b>Light-Duty Motor Vehicle Purchase or Lease Incentive</b>  <a href="http://www.terpgrants.org">www.terpgrants.org</a>	Closes Jan. 7, 2021  \$7,736,988	\$5,000 per vehicle for new light-duty (less than 10,000 lbs. GVWR) natural gas or propane vehicles; \$2,500 for electric vehicles.	No	Public and Private Entities	Statewide. Bifuel vehicles must have a min range of 125 miles on alt fuel. Conversions must occur within first 500 odometer miles.
<b>Texas Natural Gas Vehicle Grant Program</b>  <a href="http://www.terpgrants.org">www.terpgrants.org</a>	Closes Feb. 26, 2021  \$15,473,974	Replacement of Diesel and Gasoline Vehicles greater than 8,501 GVWR. Default grant amounts based on annual mileage. GVWR and CNG/LNG Propane fuel system capacity. Up to 90% of cost of dedicated natural gas or propane medium or heavy-duty vehicle. Includes repowers. First-come, first-serve.	Yes. Can submit request to move old vehicles out of North America instead of destroying them.	Public and Private Fleets; 75 percent of use must occur in eligible counties.	Clean Transportation Zone (See eligible counties below)
<b>Emissions Reduction Incentive Grants</b>  <a href="http://www.terpgrants.org">www.terpgrants.org</a>	Est. Open by Summer 2020  \$60,332,490	Heavy-duty on-road and non-road; locomotives, marine vessels, stationary equipment.	Yes	Public and Private Fleets.	TERP Effective Counties
<b>Governmental Alternative Fuel Fleet Program</b>	TBD	New motor vehicles that operate primarily on compressed natural gas, liquefied natural gas, liquefied petroleum gas, hydrogen fuel cells, or electricity, including electricity to power fully electric motor vehicles and plug-in hybrid motor vehicles. Also provides minimum of \$600,000/yr in grants to assist eligible applicants in the installation of refueling infrastructure for grant funded vehicles.	No	Statewide. State agency or political subdivision that operates a fleet of more than 15 motor vehicles, excluding motor vehicles that are owned and operated by a private company or other third party under a contract with the entity; or mass transit or school transportation provider or other public entity established to provide public or school transportation services. Grants will be available for the purchase or lease of a new, purpose-built alternative fuel vehicle, or a vehicle converted to operate on an alternative fuel before first retail sale that has a dedicated, dual-fuel, or bi-fuel system; and if fully electric or hybrid plug-in, has a U.S. Environmental Protection Agency rating of at least 75 miles per gallon equivalent or range. Lease agreement must have a term of at least three years. If replacing a vehicle that currently operates on an alternative fuel, the replacement vehicle must produce fewer emissions and have greater fuel efficiency than the vehicle being replaced.	

[www.txng.org/available-incentives](http://www.txng.org/available-incentives)



# FAQs for Board Members

## We Can Help!

Contact Heather Ball, [heather@txng.org](mailto:heather@txng.org) for best sources for the following:

- 1) Price of natural gas and propane
- 2) Cost to retrofit a bay to work on alt fuels
- 3) Cost estimate of a propane or natural gas refueling station and available grants.
- 4) Grant Estimates for Alternative Fuel Buses.
- 5) Are school districts are eligible for 50-cent per gallon tax credit on propane or natural gas dispensed at their facility? **YES**
- 6) Carbon footprint - diesel vs natural gas or propane



# Contact Information

Incentives: Heather Ball, [heather @txng.org](mailto:heather@txng.org)

Information on fuel providers, propane vehicles solutions and grants availability, please visit <https://fuelingtexas.com>

OR

Email: [info@propanecounciloftexas.org](mailto:info@propanecounciloftexas.org) or Phone: (800)325-7427

DFW- area Assistance: Amy Hodges, [ahodges@nctcog.org](mailto:ahodges@nctcog.org)  
817-704-2508



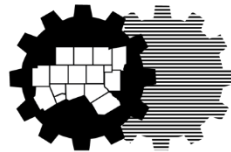


# Prosper ISD

Curtis MacDonald, Supervisor of Fleet Operations  
Jay Nelis, Shop Foreman  
Available for Questions on School Usage



Dallas-Fort Worth  
CLEAN CITIES



North Central Texas  
Council of Governments



PROPANE  
COUNCIL  
OF TEXAS

# Prosper ISD – A Propane Success Story

**Supervisor of Fleet Operations: Curtis MacDonald**

**144 Propane School Buses**

- **First Propane School Bus Acquired in 2009**

**On-site Propane Fueling Stations**

**Motivations:**

- **Environmental Impact**
- **Reliability**
- **Lower Maintenance Costs**

**Success Story: [dfwcleancities.org/successstories](https://dfwcleancities.org/successstories)**

# THANK YOU!

D/FW Clean Cities Coalition

Amy Hodges

[AHodges@nctcog.org](mailto:AHodges@nctcog.org)

(p) 817-704-2508

Propane Council of Texas

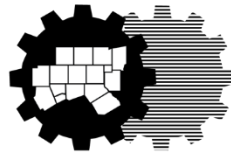
Jackie Mason

[JMason@TxPropane.com](mailto:JMason@TxPropane.com)

512-775-9612



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