

# 2020 PROGRAM OVERVIEW

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ADVANCED CLEAN TRANSPORTATION SOLUTIONS



Jack Roush  
USA

# ROUSH<sup>®</sup> Enterprises

INGENUITY ON DEMAND



## ROUSH<sup>®</sup>

ROUSH has an extraordinary combination of creative, driven people and cutting-edge technology that solves problems for hundreds of customers across the globe. We design, engineer, prototype, test and manufacture products in a wide range of industries — from transportation and theme parks to aerospace and military defense.

Combining our race-proven technology with the expertise of our advanced automotive engineers, we challenge the industry standard to take your performance to the next level.



We lead the pack by offering the most diverse, effective and value-laden motorsports marketing platforms to NASCAR fans and beyond. For over 50 years, Jack Roush has been committed to performance, having won 31 championships and more than 400 races in drag racing, sports car and stock car racing.

Our advanced clean transportation solutions reduce costs for our customers and foster healthier communities in the areas where they operate.

## ROUSH<sup>®</sup>

C L E A N T E C H



# LIQUID PROPANE AUTOGAS FUEL SYSTEM TECHNOLOGY —

The ROUSH CleanTech liquid propane autogas fuel system seamlessly integrates into the vehicle. Fuel lines follow the OEM routing, and the fuel tank generally replaces the standard tank location. The system delivers propane autogas to the engine in liquid form, ensuring zero compromise in vehicle performance.

## FUEL RAIL

Our signature anodized aluminum fuel rails operate under the varying temperatures of liquid propane autogas.

## FRPCM

The fuel rail pressure control module improves vehicle start-up times, lowers start-up emissions and provides consistent power.

## FUEL TANK

The fuel tank meets ASME certification standards. It's built 20 times more puncture-resistant than gasoline tanks and is made in the U.S.

## FUEL FILL

The design of the industry-standard valve allows for safe passage of liquid propane autogas into the vehicle. It also includes a check valve to prevent fuel leaks.

## FUEL LINES

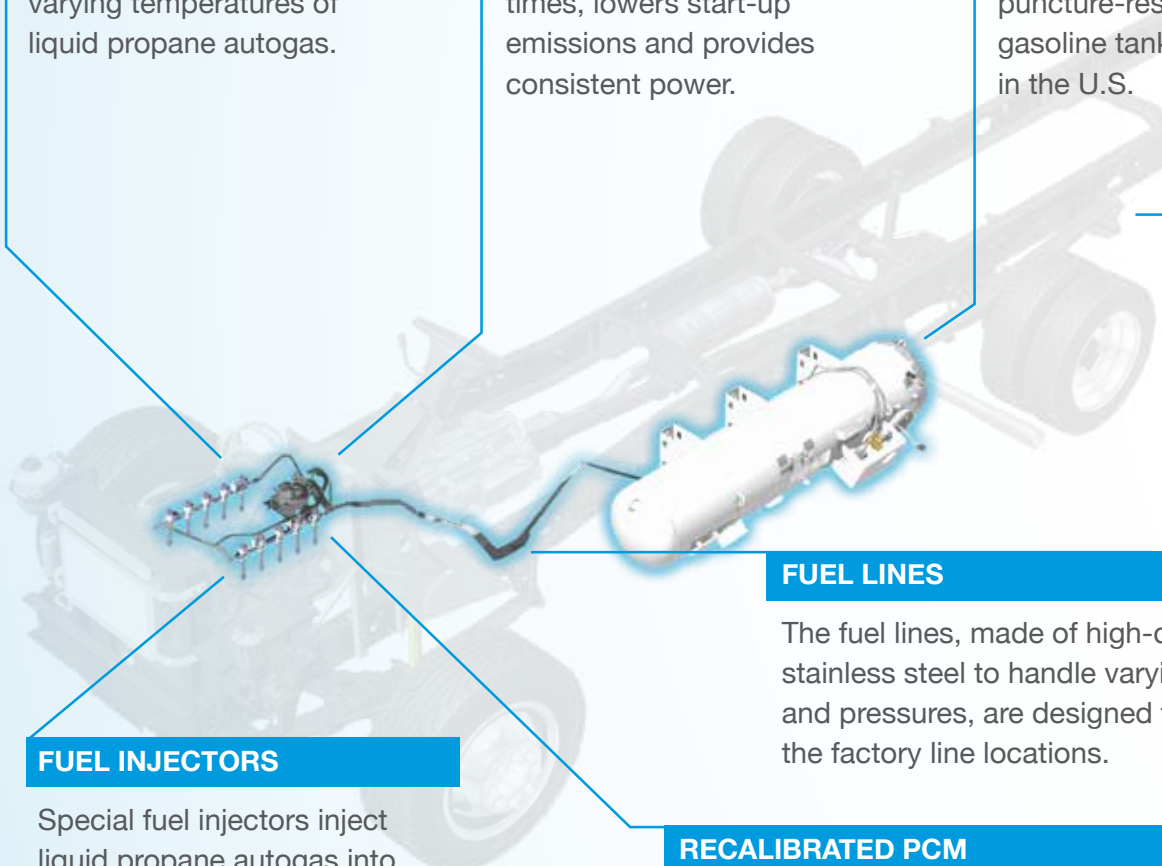
The fuel lines, made of high-durability stainless steel to handle varying temperatures and pressures, are designed to route through the factory line locations.

## FUEL INJECTORS

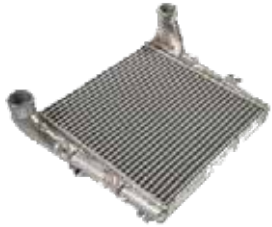
Special fuel injectors inject liquid propane autogas into the engine for ignition.

## RECALIBRATED PCM

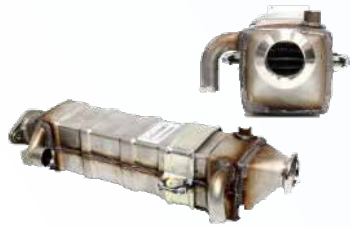
We reprogram Ford's on-board computer that controls the engine to allow the vehicle to operate properly on propane autogas.



## DO YOU RECOGNIZE THESE DIESEL COMPONENTS?



Charged Air Cooler



EGR Cooler



EGR Valve



Turbo Charger



Dosing Unit



Dosing Control Unit



Dosing Module



SCR Cat with DPF



Heated Supply Line



Block Heater



Assembly for DEF Tank



DEF Tank



NOx Sensors



Sensors & Assemblies

All of these components are eliminated when you switch to propane.

# COMMERCIAL VEHICLE OPTIONS MY2020

## Ford F-53 / F-59

Stripped Chassis  
7.3L V8



### Tech Specs

EPA & CARB approved  
F-53 GVWR: <26,000 lbs.  
F-59 GVWR: <22,000 lbs.

### Fuel Capacity

LH Saddle	45 gallons usable
Aft Axle	65 gallons usable

## Ford F-450 / F-550

Chassis Cab  
7.3L V8



### Tech Specs

EPA & CARB approved  
F-450 GVWR: <16,500 lbs.  
F-550 GVWR: <19,500 lbs.

### Fuel Capacity

RH Saddle	35 gallons usable
Extended side saddle	54 gallons usable
Aft Axle	65 gallons usable

## Ford F-650 / F-750

Chassis Cab  
7.3L V8



### Tech Specs

EPA & CARB approved  
F-650 GVWR: <30,000 lbs.  
F-750 GVWR: <33,000 lbs.

### Fuel Capacity

Single 51" LH Saddle	29 gallons usable
Single 86" LH Saddle	50 gallons usable
Dual 51" Saddle	54 gallons usable*
Aft Axle	65 gallons usable
Left Long, Right Short	74 gallons usable*

\*Total gallons usable for dual tanks combined.

Contact ROUSH CleanTech for pricing. Additional tank options and capacities coming soon.

## Ford E-350

SRW and DRW Cutaway and Stripped Chassis  
7.3L V8



### Tech Specs

EPA & CARB approved  
SRW GVWR: < 10,050 lbs.  
DRW GVWR: < 12,500 lbs.

### Fuel Capacity

Aft Axle 41 gallons usable

## Ford E-450

DRW Cutaway and Stripped Chassis  
7.3L V8



### Tech Specs

EPA & CARB approved  
GVWR: <14,500 lbs.

### Fuel Capacity

Aft Axle	41 gallons usable
Extended Aft Axle	64 gallons usable

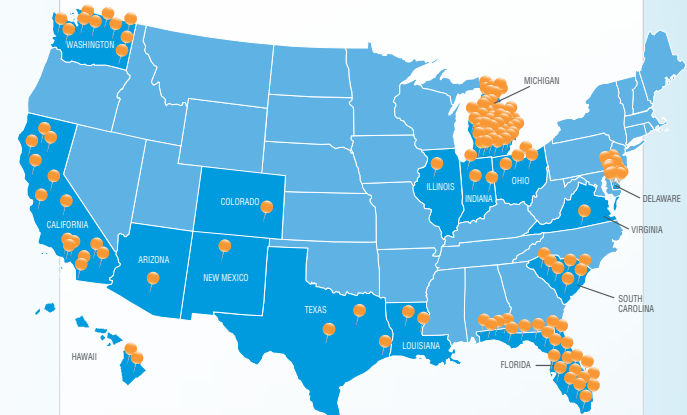
## FOR TRANSIT FLEETS



E-350 / E-450

F-450 / F-550

F-650 / F-750



**ROUSH CleanTech propane autogas transit shuttles across the nation include:**

ARIZONA.....	4	LOUISIANA.....	16
CALIFORNIA.....	170	MICHIGAN.....	435
COLORADO.....	3	NEW MEXICO.....	1
DELAWARE.....	165	OHIO.....	34
FLORIDA.....	238	SOUTH CAROLINA.....	51
HAWAII.....	20	TEXAS.....	14
ILLINOIS.....	6	VIRGINIA.....	6
INDIANA.....	25	WASHINGTON.....	210



# SCHOOL BUS PRODUCT OVERVIEW

## Blue Bird Vision MY2020



## CONFIGURATION OPTIONS

BODY MODEL	WHEELBASE	PROPANE*	GASOLINE*
BBCV1910	169"	47	45
BBCV2311	189"	69	60
BBCV2508	217"	69	60
BBCV2610	217"	69	60
BBCV2807	238"	69	60
BBCV3011	252"	69	60
BBCV3201	273"	69	60
BBCV3303	273"	69 / 98	60 / 100
BBCV3310	273"	69 / 98	60 / 100
BBCV3507	280"	69 / 98	60 / 100



### Tech Specs

EPA & CARB approved  
GVWR: 33,000 lbs.  
Up to 77 passengers

### Fuel Capacity

Short tank	47 gallons usable
Standard	67 gallons usable
Extended	93 gallons usable



### Tech Specs

EPA & CARB approved  
GVWR: 33,000 lbs.  
Up to 77 passengers

### Fuel Capacity

Standard tank	60 gallons usable
Extended tank	100 gallons usable

\*Tank capacity in gallons. Contact your local Blue Bird dealer at [www.blue-bird.com/find-a-dealer](http://www.blue-bird.com/find-a-dealer) for pricing.



**Our Partnership with Blue Bird:** ROUSH CleanTech has partnered with Blue Bird since 2012 to bring customers the best-selling Type-C propane school bus on the market. The Blue Bird Vision and Micro Bird G5, equipped with our propane fuel system, offer school districts many non-diesel options for school bus transportation.

## Micro Bird G5 MY2020

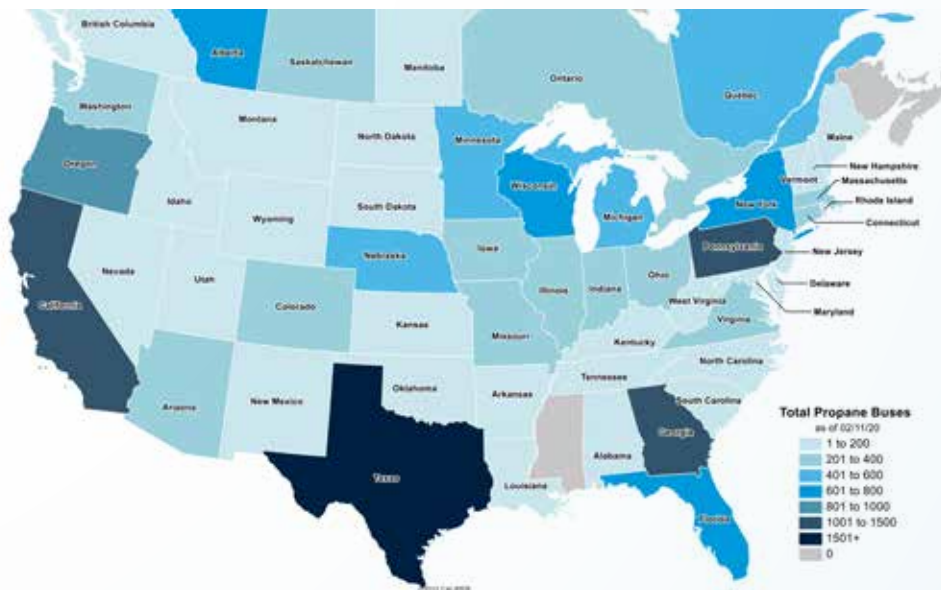


### Tech Specs

EPA & CARB approved  
GVWR: 14,500 lbs.  
Up to 30 passengers

### Fuel Capacity

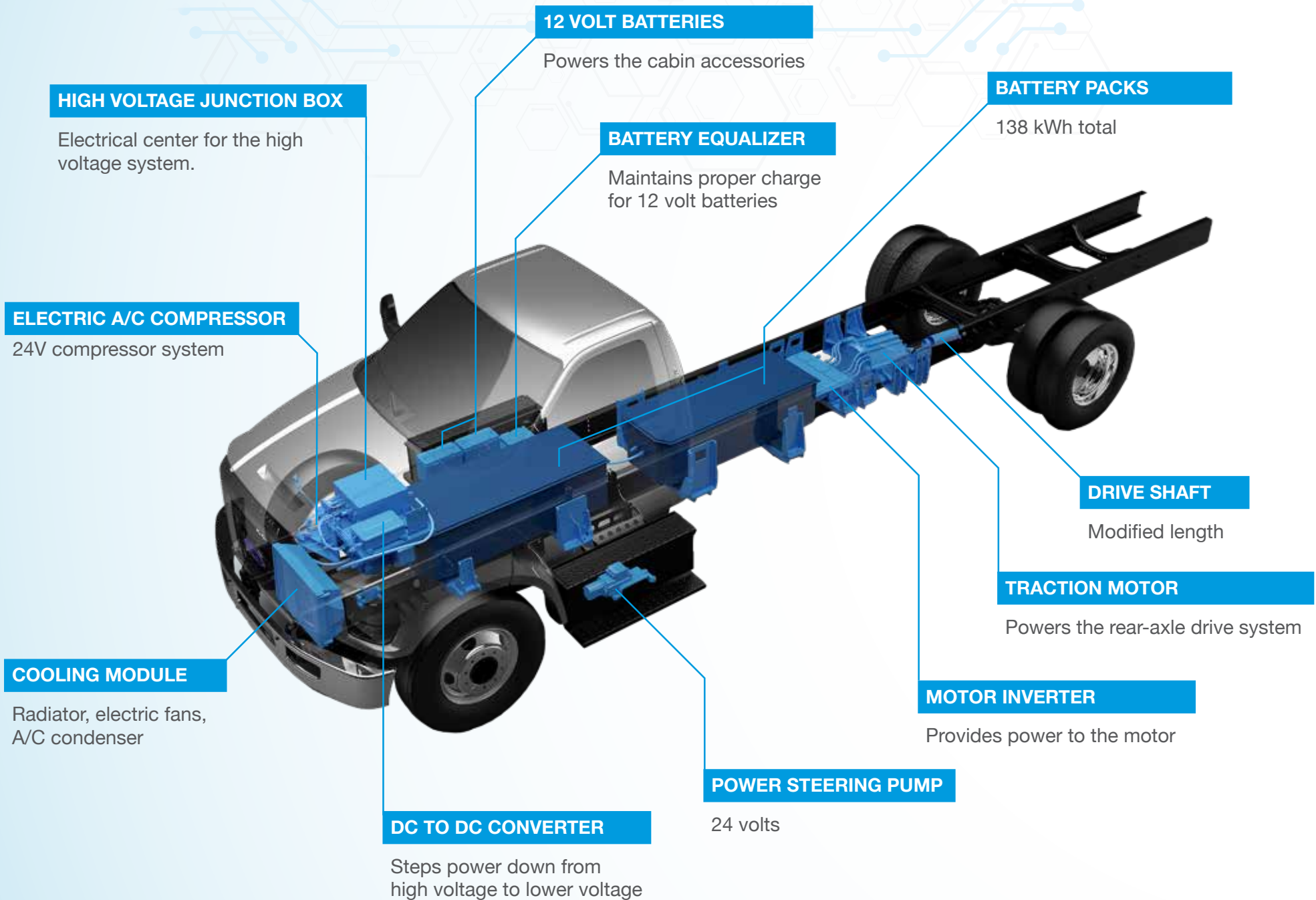
Aft Axle tank                      41 gallons usable



## PROPANE SCHOOL BUSES ACROSS NORTH AMERICA

- Over 20,000 propane buses in North America.
- More than 1,000 school districts operating propane buses.

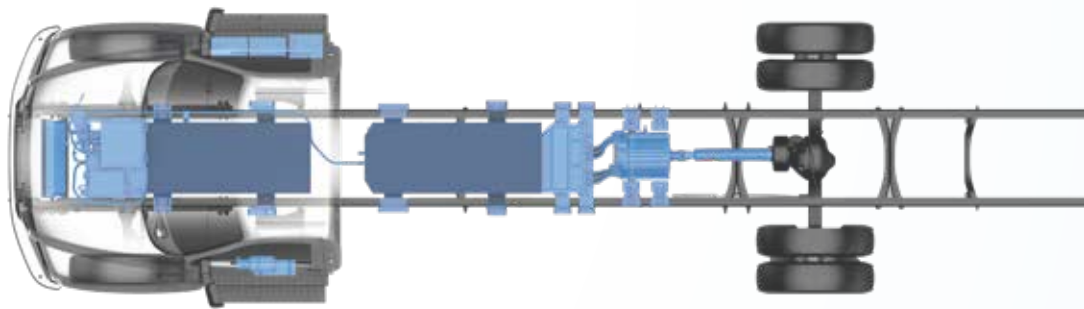
# ZERO EMISSION BATTERY ELECTRIC VEHICLE



## Ford F-650 MY2021



**Battery Electric Vehicle Side View**



**Battery Electric Vehicle Top View**

### BATTERY SYSTEM

<b>Energy</b>	138kWh
<b>Voltage</b>	400 V
<b>Battery Design</b>	2 modular battery packs
<b>Chemistry</b>	Lithium Ion (NMc)
<b>Motor Type</b>	DC medium-voltage system
<b>Transmission</b>	Direct drive

### CHASSIS SPECS

<b>GVWR</b>	26,000 lbs
<b>Wheelbases</b>	242" / 260" / 281"
<b>Range</b>	100 miles*
<b>Gradeability</b>	17%

\*May vary based on GVWR, applications, driver habits and road conditions.

ROUSH CleanTech has deployed more than 25,000 alternative-fuel vehicles since 2010. We now bring that expertise and customer success to the electric vehicle market.

Packed with power and performance, our zero-emission, all-electric vehicle is backed by decades of electric vehicle engineering expertise from Roush.

With more than 20 years of electric vehicle development experience, ROUSH CleanTech continues to innovate in the advanced clean transportation sector to deliver solutions for a more sustainable future.

# THE BENEFITS OF PROPANE AUTOGAS

REDUCES

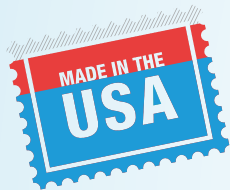
✓ Fuel Costs

✓ Emissions

✓ Maintenance Costs

✓ Total Operating Costs

## REDUCES DEPENDENCE ON FOREIGN OIL



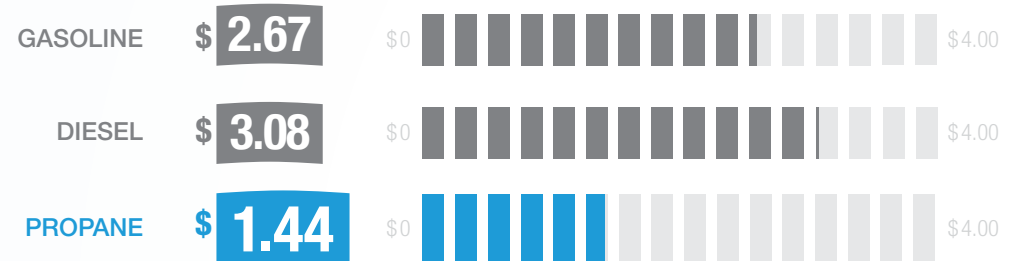
Propane is  
**DOMESTICALLY  
PRODUCED**

**90%** comes from  
the U.S.

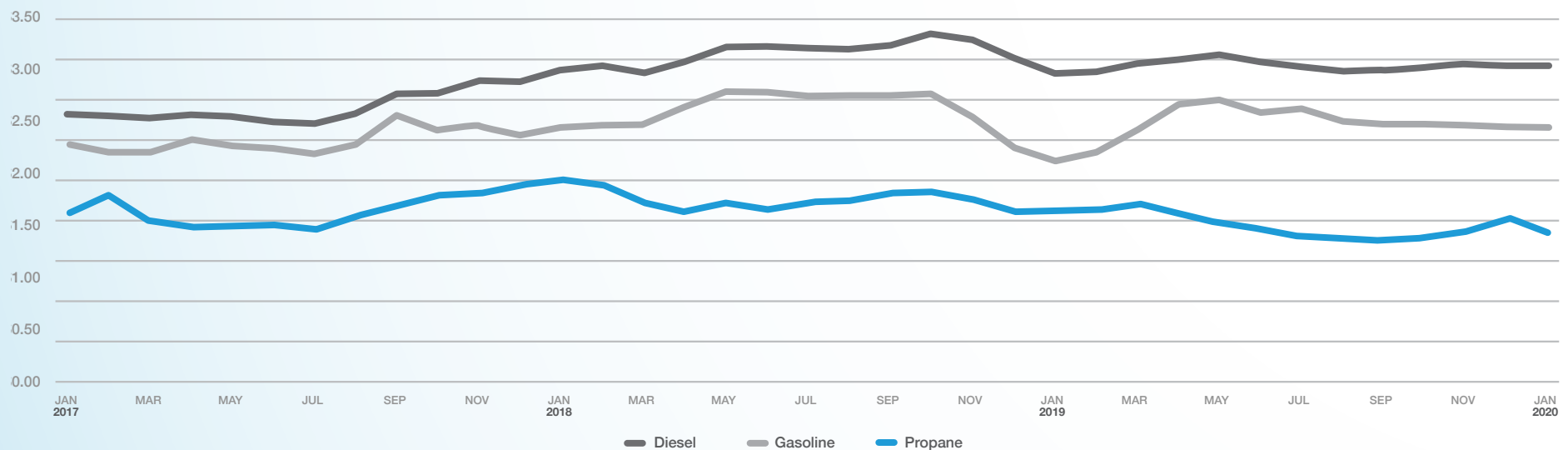


## COST COMPETITIVE

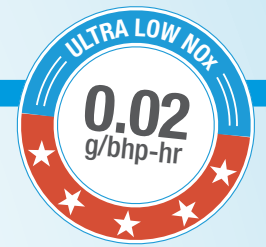
Average wholesale prices as of January 2020.



## CONSISTENTLY LOW AND STABLE PRICING



# ULTRA-LOW NOX EMISSIONS



## WHAT IS NOX?

Nitrogen oxides, known as NO<sub>x</sub>, are highly reactive gases composed of nitrogen and oxygen. They form when fuel is burned at high temperatures. NO<sub>x</sub> are regulated under federal air quality standards because they are known to be harmful to human health and to the environment.

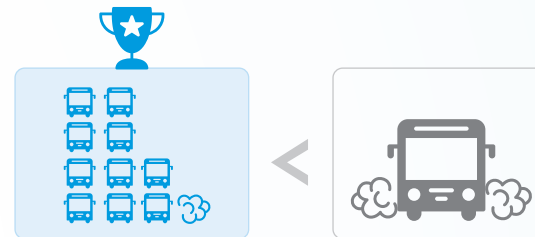
## WHERE DOES NOX COME FROM?

Approximately 55 percent of man-made NO<sub>x</sub> emissions comes from motor vehicles. According to a University of California Riverside study, diesel-fueled medium- and heavy-duty vehicles are the number one source of NO<sub>x</sub> emissions in almost every single metropolitan region in the U.S.

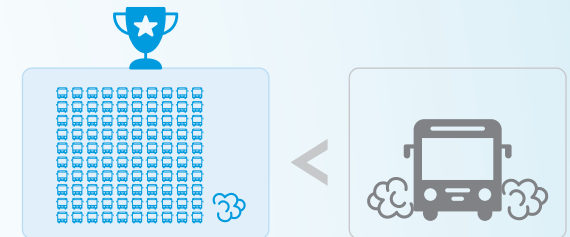
Source:  
U.S. Energy Department, Alternative Fuels Data Center  
[www.afdc.energy.gov/vehicles/emissions\\_pollutants.html](http://www.afdc.energy.gov/vehicles/emissions_pollutants.html)

**We have developed the lowest NO<sub>x</sub> level of any engine in class 4-7!**

The ROUSH CleanTech propane engine is certified to the optional low NO<sub>x</sub> level of 0.02 g/bhp-hr, making it **90 percent cleaner** than the EPA's strictest emissions standard.



**10** Blue Bird Vision Propane buses emit less NO<sub>x</sub> than one school bus certified at today's current standard.



**100** Blue Bird Vision Propane buses emit less NO<sub>x</sub> than one school bus manufactured before 2007.

Vehicle Model Year	EPA's NO <sub>x</sub> Standard*	ROUSH CleanTech 6.8L V10 3V propane engine*
1998	4.0	99% cleaner
2002	2.5	98% cleaner
2007	1.2	95% cleaner
2010-current	0.2	90% cleaner

\*Measured in g/bhp-hr

## ULTRA-LOW NOX MODELS FROM ROUSH CLEANTECH



F-53 / F-59



E-350 / E-450



F-450 / F-550



F-650 / F-750



Blue Bird Vision

# AFTER SALES SUPPORT



## Contact and Support

You can rely on ROUSH CleanTech's Customer Success department after your new vehicles are in operation. Our extensive after-sale customer support includes field service, a call center, warranty assistance, technical publications and training. Our team members are with you every step of the way.



**800.59.ROUSH**



**support@ROUSHcleantech.com**



**ROUSHcleantech.com/service**



## Partners

ROUSH CleanTech partners with Ford, Blue Bird and independent service centers to create a nationwide network of qualified experts.



## Service Network

We support our partners by providing technical support and contact center assistance. We make sure that each of our partners are properly equipped with the tooling, training and service diagnostic information to effectively service and maintain the ROUSH CleanTech fuel system with our expanding service network. Our team's mission is to help you diagnose any issues that may arise and get your vehicle back on the road as quickly as possible.



**ROUSH CleanTech offers an expanding service network with more than 500 locations across the country.**



## Training and Technical Publications

ROUSH CleanTech offers a variety of propane autogas system training options instructed by one of our expert trainers, a field service engineer or online. Our training library gives customers the flexibility to complete the program at their own pace. If additional

training is needed after going through our online training program, we can send a ROUSH CleanTech training expert to complete on-site training.

Technical publications are available on our website at no charge. You can find regularly updated service and diagnostic manuals, wiring schematics and more on our Service web page, [ROUSHcleantech.com/service](http://ROUSHcleantech.com/service).

### FACTORY TECHNICIAN

**WORKSHOPS** provide hands-on training to service centers and customers at our Livonia, Michigan location. To register for one of our Factory Technician Workshops, please visit the Service tab on the ROUSH CleanTech website.



**ON-SITE TRAINING** depends on customer's needs and experience with ROUSH CleanTech vehicles. On-site training ranges from a two-hour Vehicle Overview to a full-day Advanced Diagnostics Training.



## VIDEOS



- Repair and Diagnostic Videos
- News Updates
- "How to" Videos
- Fuel and Driving Demonstrations

## WEB-BASED MODULES



- Component Overview
- Diagnostics
- Warranty Information
- Propane Properties and Safety

## TECHNICAL PUBLICATIONS



- Service Manuals
- Diagnostic Manuals
- Repair and Service Procedures
- Special Service Messages

# TOTAL COST OF OWNERSHIP

Determine your total cost of ownership for clean-burning, cost-saving propane.

Fill in the boxes for your current fuel type and watch your savings add up.

## 1. FUEL

		
\$ <input type="text"/>	\$ <input type="text"/>	\$ <input type="text"/>

## 2. PREVENTATIVE MAINTENANCE

+	+	+
\$ <input type="text"/>	\$ <input type="text"/>	\$ <input type="text"/>

## 3. INCREMENTAL COST

+	-	+
\$ <input type="text"/>	\$ <input type="text"/>	\$ <input type="text"/>

## 4. DIESEL COMPONENTS

-	-	+
\$ <input type="text"/>	\$ <input type="text"/>	\$ <input type="text"/>

## TOTALS

=	=	=
\$ <input type="text"/>	\$ <input type="text"/>	\$ <input type="text"/>

## 1. FUEL

Average lifetime miles per vehicle



miles

/

Average fuel economy

mpg

x

Fuel price per gallon

\$  /gal

=

Lifetime fuel cost

\$



miles

/

mpg

x

\$  /gal

=

\$



miles

/

mpg

x

\$  /gal

=

\$

## 2. PREVENTATIVE MAINTENANCE

Oil change interval



5000 miles



5000 miles



7000 miles

Oil change requirements



7 quarts



7 quarts



17-30 quarts

Cost per oil change

Taxes and labor costs not included.

\$

\$

\$

## 3. INCREMENTAL ACQUISITION COST



Ford F-750, 50 usable gallon tank

\$

\$

\$



\$  6,000

\$  -3,000

\$  0

Ask your ROUSH CleanTech representative for rebate or funding opportunities.

## 4. DIESEL COMPONENTS



DEF Head Unit  \$300

Charged Air Cooler  \$400

EGR Valve  \$590

EGR Cooler  \$920

SCR Cat with DPF  \$10,500

Turbo Charger  \$2,700

Estimated costs of diesel components eliminated when operating propane or gasoline.

Savings on diesel components  \$