



Near Zero Emission Propane Autogas Engines



800.59.ROUSH

ROUSHcleantech.com

Roush at a Glance

Michigan-based

Privately held

Founded in 1976

Over 3,700 employees

Over 2.8 million sq. ft. office/development space

Primary activities:

- Engineering
- Testing
- Prototype Development
- Manufacturing
- Motorsports Management

Enterprise Brand Portfolio

ROUSH[®]

ROUSH Industries

OEM manufacturing, engineering, prototyping and design



Roush Fenway Racing

NASCAR racing team(s)



ROUSH Performance

Industry leading high performance vehicles

ROUSH[®]
CLEANTECH

ROUSH CleanTech

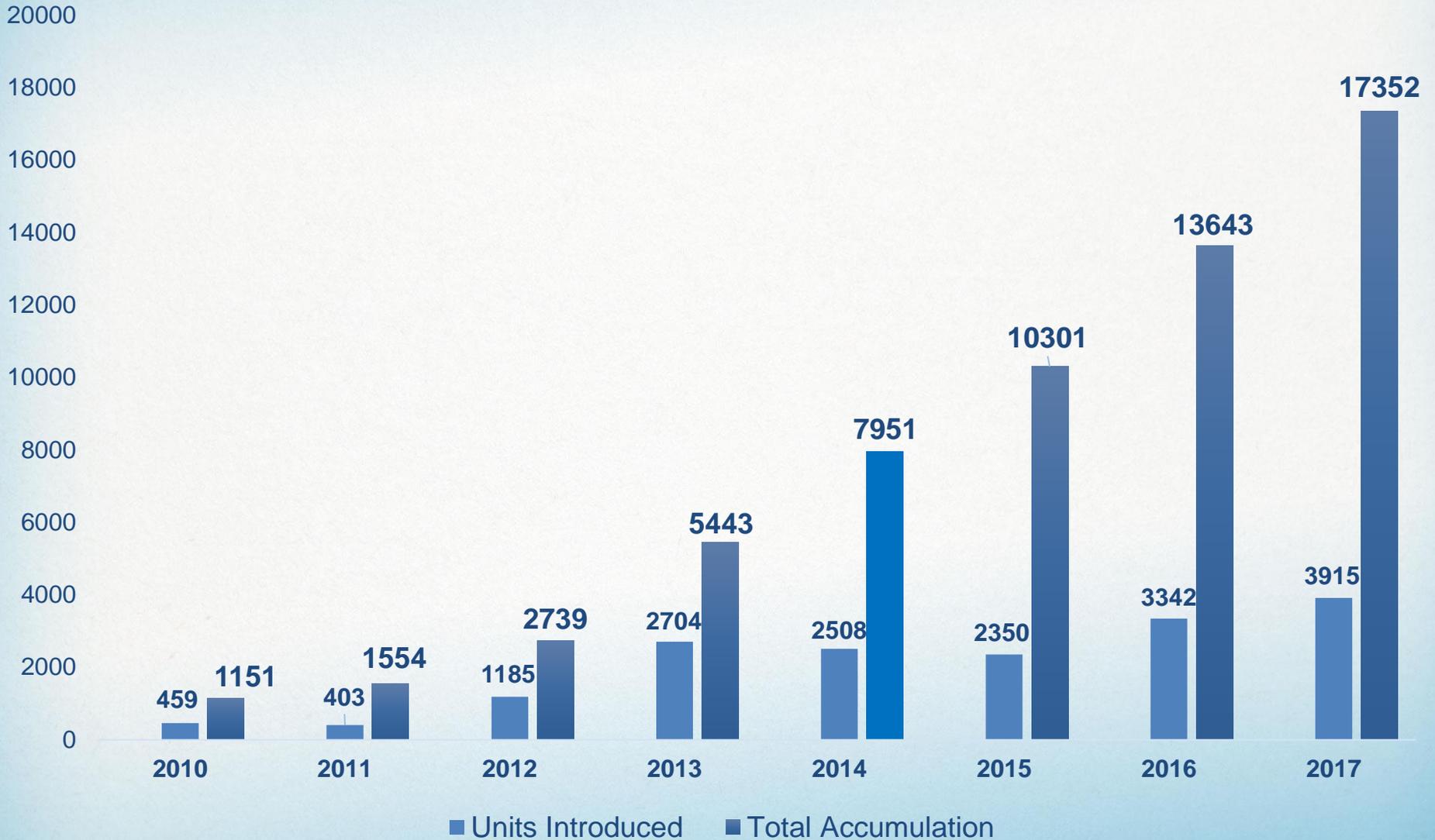
Propane autogas powered commercial vehicles.



- Founded in 2010.
- Dedicated to developing quality alternative fuel solutions.
- Propane autogas focus.
- EPA and CARB certification.
- Platform customization to suit customer needs.
- Reduces operating costs, carbon footprint.
- OEM support through Ford and BPN dealers.
- Creating opportunities for partner companies.
- Using American fuel and American technology.

- Technology Innovation
- Manufacturing Process
- Supply Chain Development
- Sales & Marketing Process
- Product Offering
- Service Network

Units in Operation





OVER

17,000

VEHICLES ON
THE ROAD

ACCUMULATED
OVER

400

MILLION MILES

OVER

700

SCHOOL
DISTRICTS

OVER **600** MILLION GALLONS OF PROPANE

Why The Hockey Stick?

- Reliable Technology & Robust Service Program
- Strong OEM Partners/Ford & Blue Bird
- 1,000 Customers & 400 Million Miles of Data
- Low Cost Infrastructure
- Plentiful Fuel
- Emerging Low NOx Certifications
- Easy to Scale

Propane Autogas Product Lineup

- Medium duty Ford trucks, chassis cabs, cutaways, and stripped chassis; and Blue Bird Type A and C school bus.
- Factory Ford warranty maintained.
- No loss of HP / torque / towing capacity.
- Serviceable with existing diagnostic equipment.
- EPA & CARB Certified.



Ford F-53 / F-59

Ford E-450

Ford F-450/550

Ford F-650/750

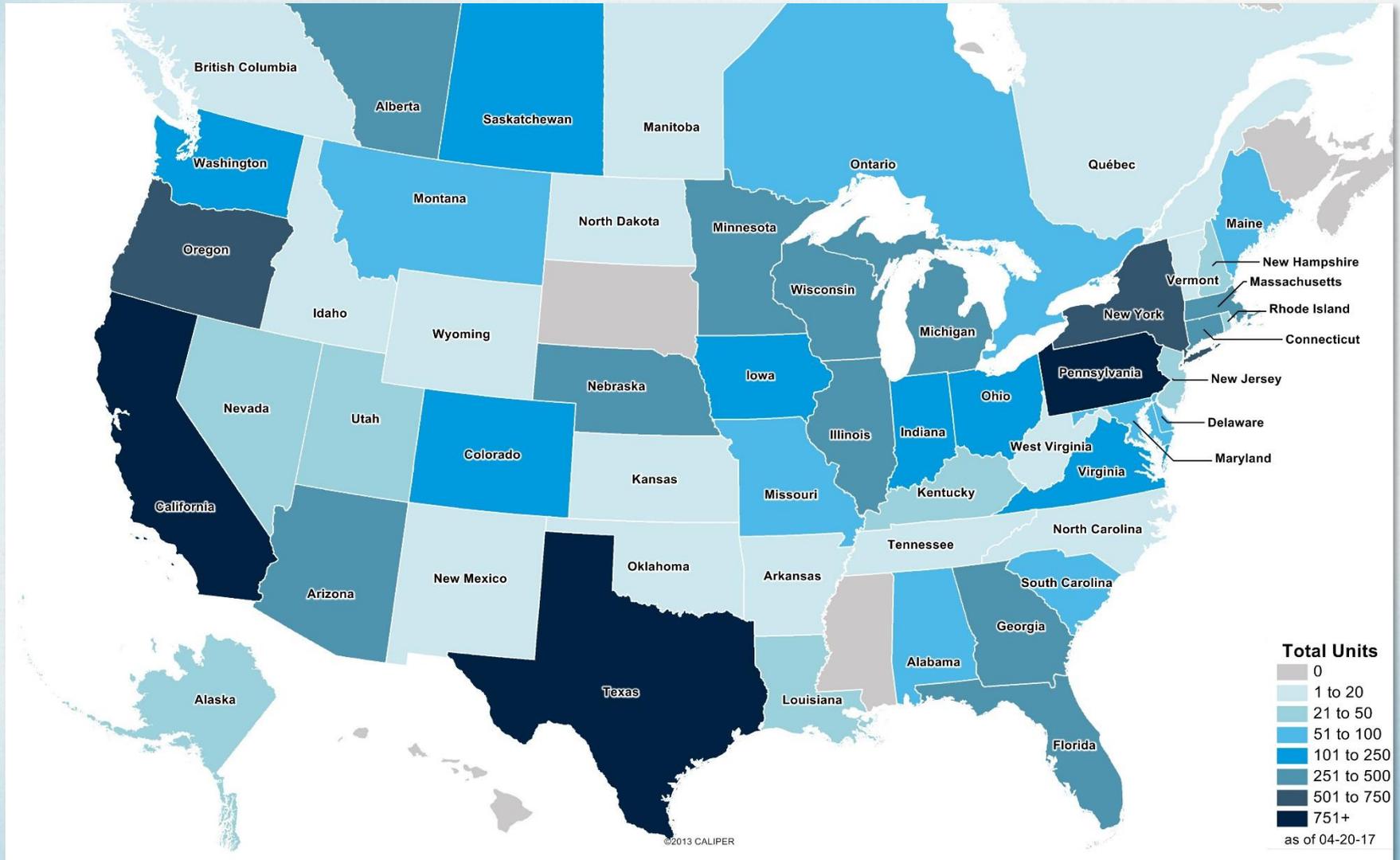
Blue Bird Vision

Micro Bird G5



STUDENT TRANSPORTATION

Propane School Bus Deployments



A Growing Trend

10,000

SCHOOL
BUSES



OVER
700

SCHOOL
DISTRICTS





FOOD & BEVERAGE



Ready Refresh
JUST CLICK AND QUENCH
by Nestlé
ReadyRefresh.com

YOU
choose
WE
deliver!

Powered by
CLEAN BURNING PROPANE AUTOGAS

Stroehmann's

**Little
Bites**

Stroehmann Line Haul L.P.
255 Business Center Drive
Horsham Pa. 19044
U.S. DOT 665959
GVW 19,500





PUBLIC TRANSIT



Metropolitan Transit System

3102

MTS

OPERATED BY
FIELD TRAVEL
CORPORATION
28 00007



PARATRANSIT

DART
Delaware Transit Corporation

PARATRANSIT



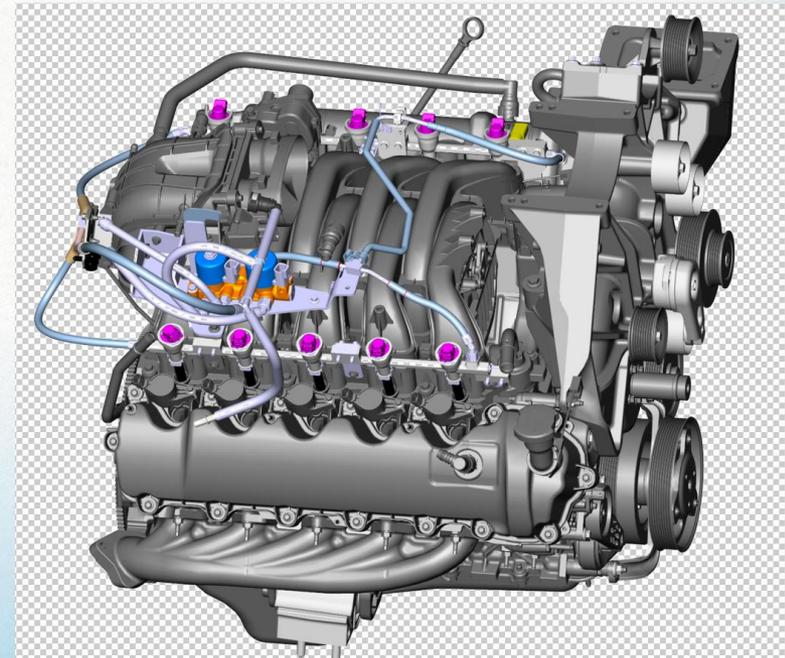
ULTRA LOW NO_x EMISSIONS

- ARB is encouraging all Manufacturers of Record (MORs) to overachieve on the NOx standard to support smog reduction.
- ARB has issued alternative standards at 0.1, 0.05 and 0.02g/bhp-hr for NOx.
- The recent VW settlement also includes funding that supports NOx reductions across all 50 states that off sets the increase in NOx caused by their diesel emissions.

Achievement of Ultra Low NOx starts with a high quality production engine

At ROUSH CleanTech, we start with:

- Ford 6.8L V10 3V Spark Ignition
- Used by Ford in all HD Vehicle applications
- F 450/550 Chassis Cab
- F 650/750 Chassis Cab
- F 53/59 Stripped Chassis
- 320 HP/460 Lbs. Ft
- Close to 2 Million in operation
- Started production in 1997
- For gasoline, meets or exceeds all emissions standards presently through 2017.



Achieve Ultra Low NOx Standards

- Given a solid base of a high quality production powertrain Roush CleanTech then certified the same engine utilizing propane autogas
 - The ROUSH CleanTech designed fuel control system starts with the PCM as provided by Ford
 - RCT then adds the complete fuel system including the injectors and an add on control module (SRM)
 - Creates a new calibration but maintains normal drivability
 - Initially certified the 6.8L for the 2013MY
 - Meets and exceeds all applicable emissions standards

	CO	CO2	NOx	NMHC
Full Useful Life STD	14.4	627	0.2	0.140

- Need to significantly over achieve NOx to statistically achieve the standard.

June 7th 2017 ROUSH CleanTech announces achievement of very low NOx with the 6.8L V10 Engine.

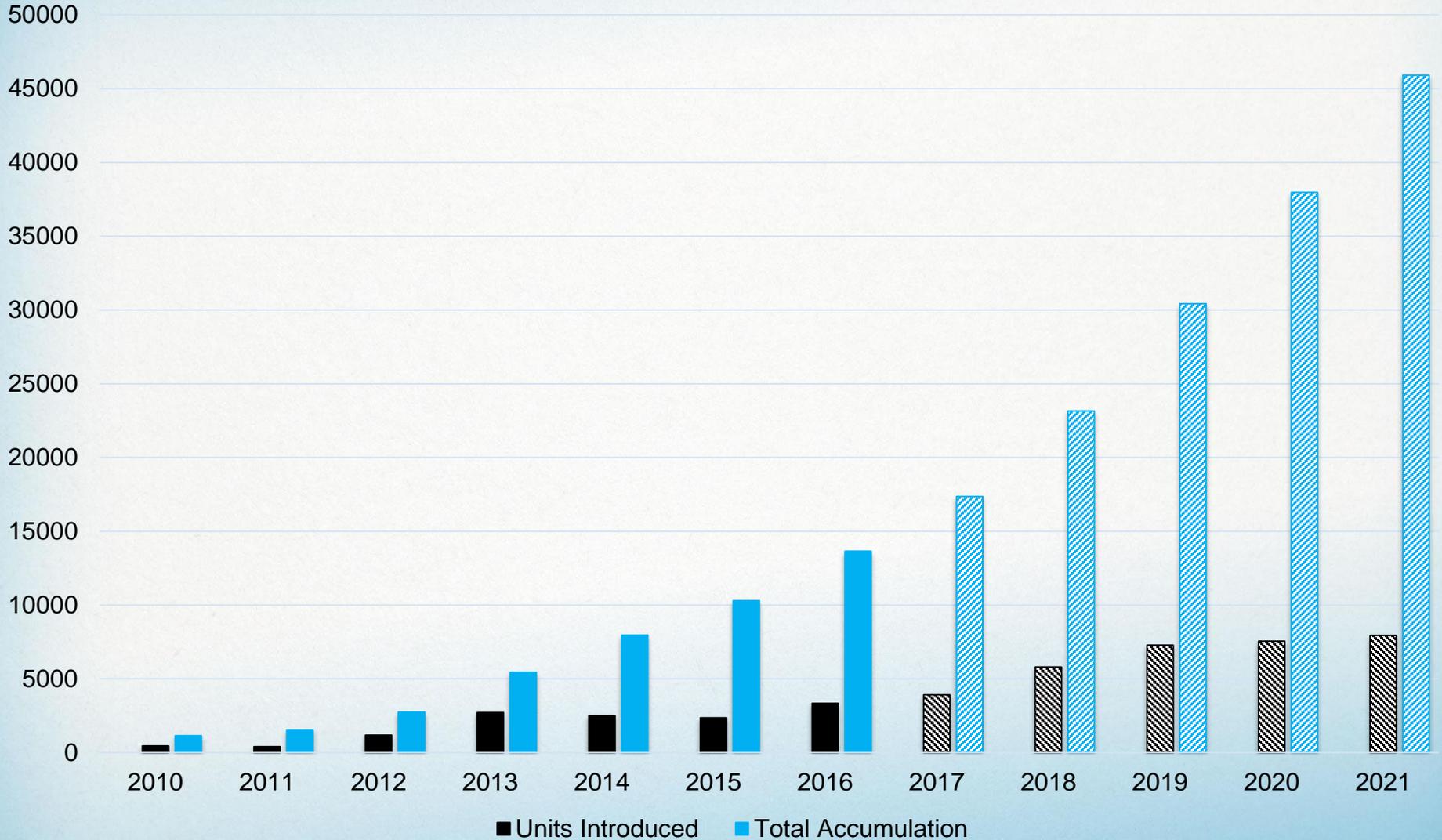
- For the 2017 MY RCT LPG Blue Bird Buses and applicable Ford Truck upfits are now certified to **0.05 g/bhp-hr NOx**.
- This is achieved with **no extra hardware or increased variable cost**.

	CO	CO2	NOx	NMHC
Full Useful Life STD	14.4	627	0.05	0.140
Actual Cert Level	2.7	614	0.03	0.04

- The low NOx levels were achieved through careful, significant calibration changes and a CSSR (cold start spark retard) approach.

WHERE ARE WE HEADED.....

2021: Units in Operation



- Significant cost per mile reduction vs diesel based on lower fuel and maintenance costs
- Low cost of infrastructure
- Comparable range to diesel
- Cleaner
- Domestic
- Evidence manual grows

Best NOx reduction per dollar spent in the class 4-7 market



THANK YOU

800.59.ROUSH

ROUSHcleantech.com

Todd Mouw

Vice President of Sales
and Marketing

734.466.8069

Todd.Mouw@roush.com