

SCHOOL BUS ALTERNATIVE FUELS WORKING GROUP MEETING 3 (P.A. 26-63)

Bureau of Air Management
September 16, 2026

AGENDA

- **2:30 Welcome and Roll Call**

- **2:40 Propane school bus emissions and case study from Norwalk Public Schools**
  - Todd Mouw with ROUSH CleanTech
  - Joel Stutheit with Propane Education Research Council(PERC)
  - Johanna Zanvettor, Transportation Coordinator with Norwalk Public Schools

- **3:10 Discussion and Questions**

- **3:30 Adjourn**



ROLL - WORKGROUP MEMBERS

State Gov't: DEEP, DOT, DOE, DPH	Act. Cmr. Emma Cimino, Graham Curtis, Robin Cecere, David Kallander
Connecticut Green Bank	Kevin Moss
School Transportation Provider: DATTCO	Don Devivo
Municipal School Representative: Branford Public Schools	Blaize Levitan
Alt Fuels Industry: Clean Fuels Alliance America	Floyd Vergara
Environmental Organization: World Resource Institute	Brian Zepka, Sue Gander & Alice Kwak
Connecticut Clean Transportation Coalition	Paul Wessel, Daphne Dixon, & Craig Peters
Other Interested Parties	CT Energy Marketers Association (CEMA): Chris Herb & Don Cusson Kolmar America, Inc.: Eli Petersen

ROLL - WORKGROUP MEMBERS

Connecticut Conference of Municipalities	Randy Collins
Connecticut Association of School Business Officials	Sherri DiNello
Connecticut Council of Small Towns	Betsy Gara
Connecticut Association of Public School Superintendents	Tom Giard & Frances Rabinowitz
Connecticut Association of Boards of Education	Sheila McKay & Patrice McCarthy (invited)
Alternative Fuels Coalition of Connecticut	Michael Morrisey (propane autogas)
CT Utilities	Eversource: Sean Tully, Nikhon Schuler, & Kevin Boughan UI: Brian Morris & Rick Rosa
Capital Region Education Council	Deb Borrero, Mason Thrall, and Nakisha Strickland
Propane Industry	Joel Stutheit (PERC) & Todd Mouw (ROUSH CleanTech)

CHARGE OF THE WORKGROUP



- DEEP must establish a working group to evaluate the increased use of alternative fuels and technologies in school buses
- The fuels to be assessed include, but are not limited to:
  - **Biodiesel**
  - **Propane**
  - **Electricity**
- Report due February 1, 2027
- See: P.A. 26-63, Sec. 36

Todd Mouw, from ROUSH CleanTech

ROUSH 50

Advanced Clean Transportation Solutions

ROUSH CLEANTECH

Roush at a Glance

Privately Held

Michigan-based

Founded in 1976

5,000+ Employees

3 MILLION sq. ft. office / development space

50 YEARS of product development expertise

PRIMARY ACTIVITIES

Design | Engineering | Prototyping | Testing | Manufacturing



ROUSH®

Roush Experience

ROUSH50

1998 — Ford Ranger EV Prototyping



1999 — 1st Hybrid Transmission Prototype Build & Test



2005 — Ford Escape HEV Prototyping



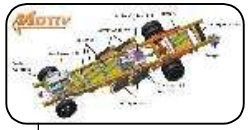
2008 — Fisker Design Engineering



2009 — Roush Electric Vehicle



2011 — Motiv BEV Assembly



2011 — Blink Charger Assembly



2012 — VIA Motors Design & Prototyping



2014 — Google Firefly Design & Production



2014 — Cummins AEOS Class 7 EV Demo



2018 — FarmWise Agribot



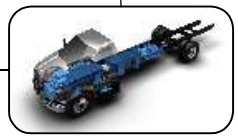
2019 — Canoo



2020 — CARB UPS Hydrogen Fuel Cell Electric Vehicle



2021 — ROUSH CleanTech F-650 BEV



2021 — Nuro AI Delivery Bot



2022 — Thor TVV



2022 — MBRDNA Battery Testing



2023 — ROUSH CleanTech F-650 BEV Gen2



2024 — Yamaha Hydrogen Outboard Boat

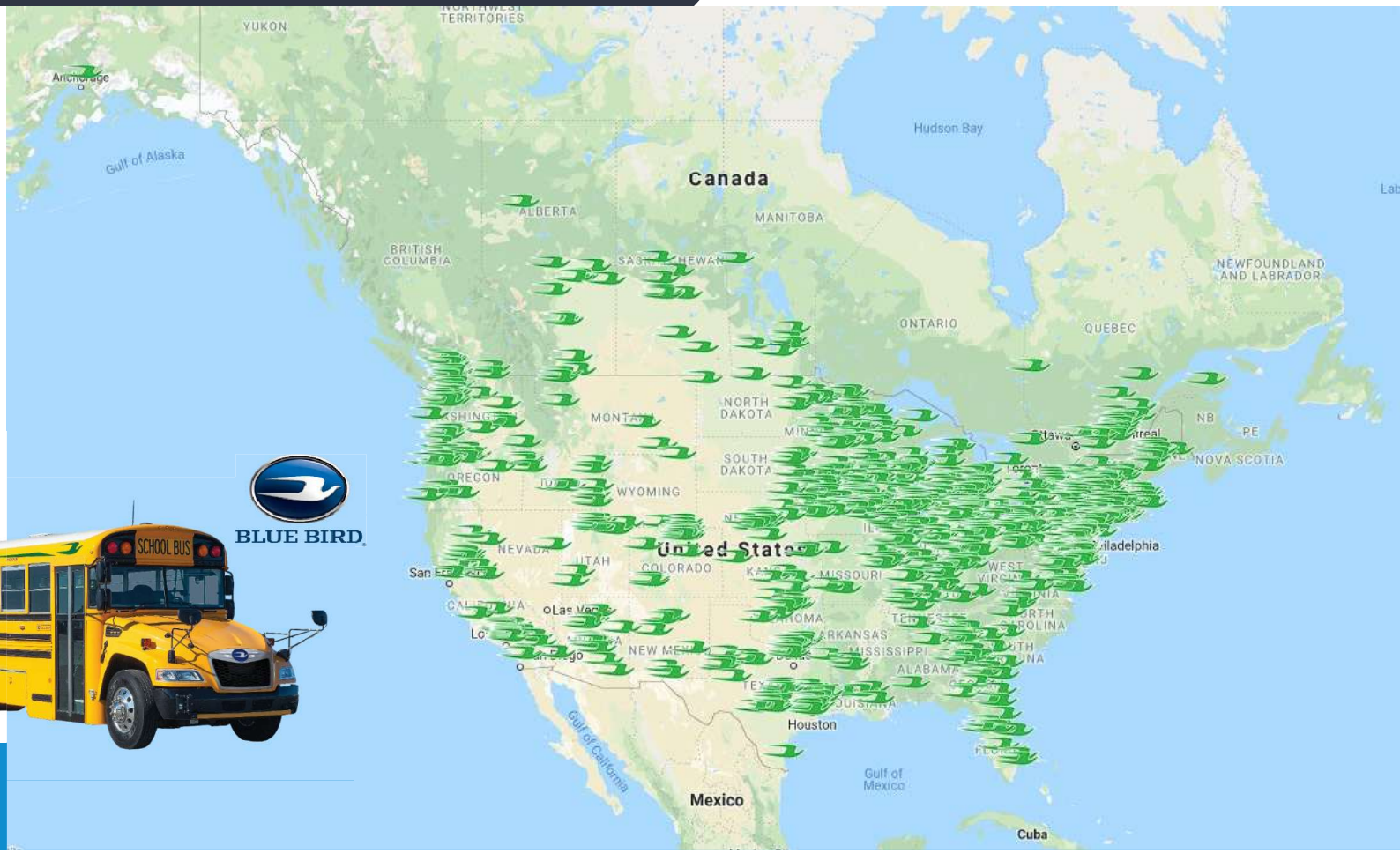


Propane School Bus Deployments

ROUSH CLEANTECH

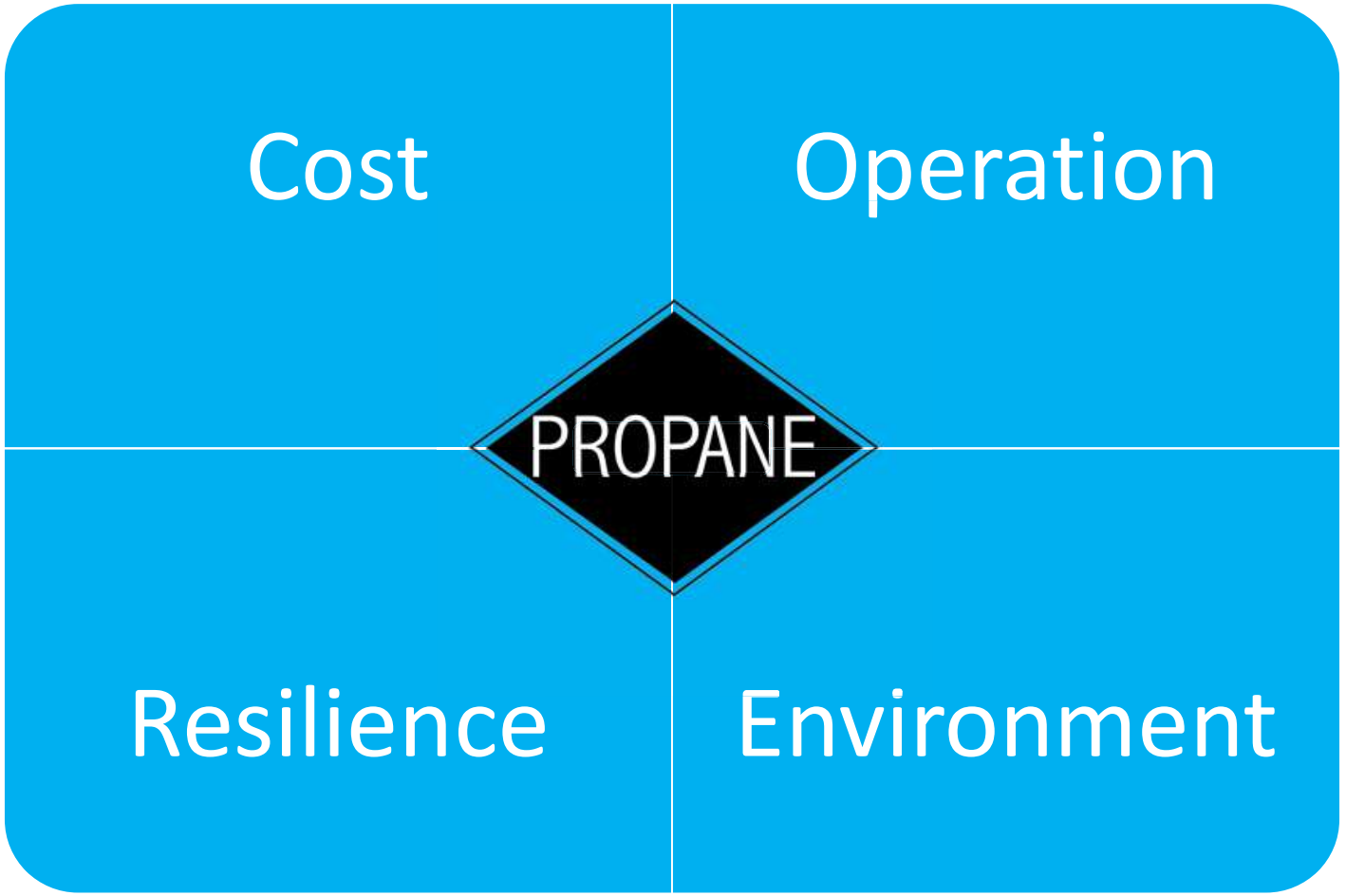
More than
24,000
on the road





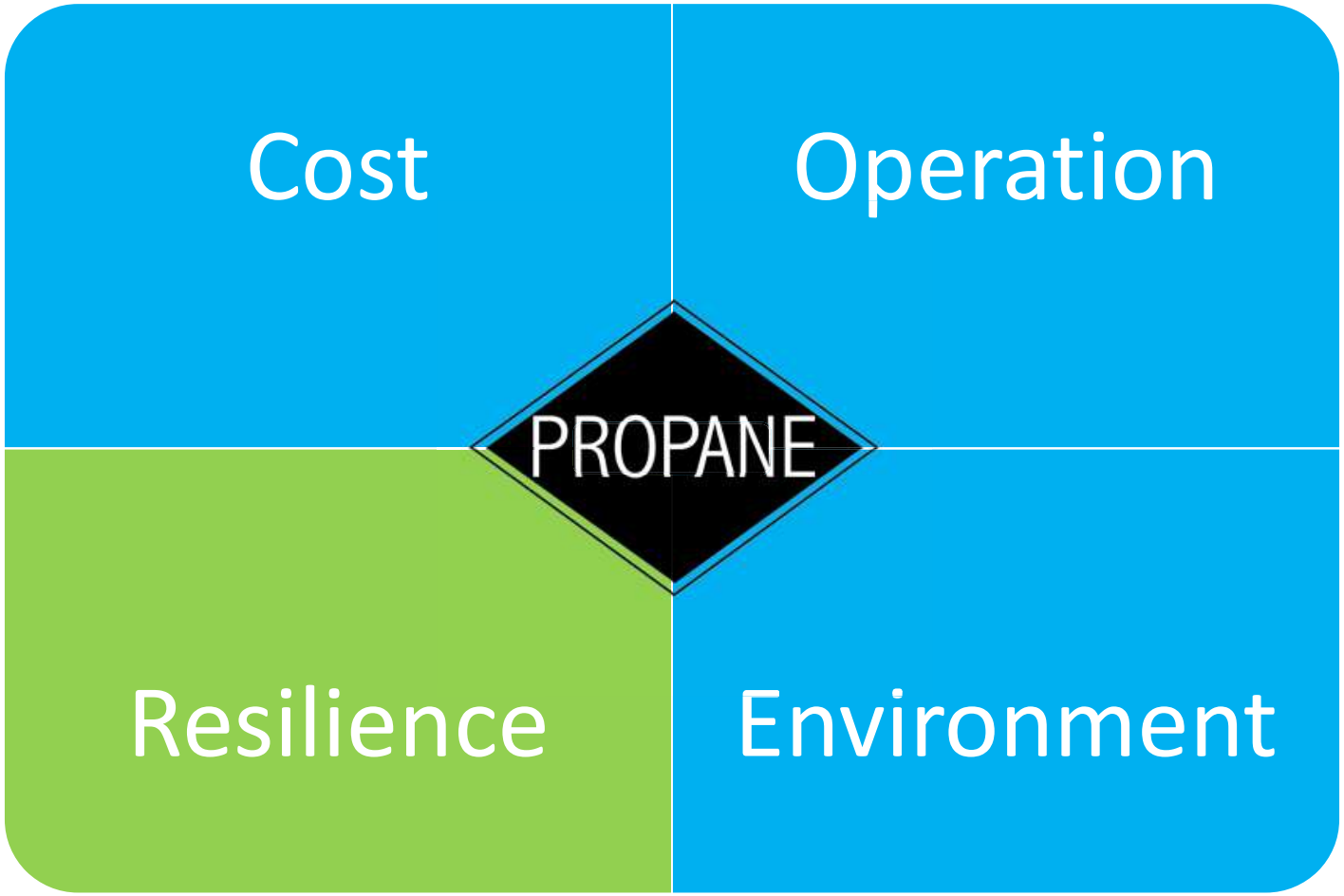
CORE Factors

ROUSH CLEANTECH



CORE Factors

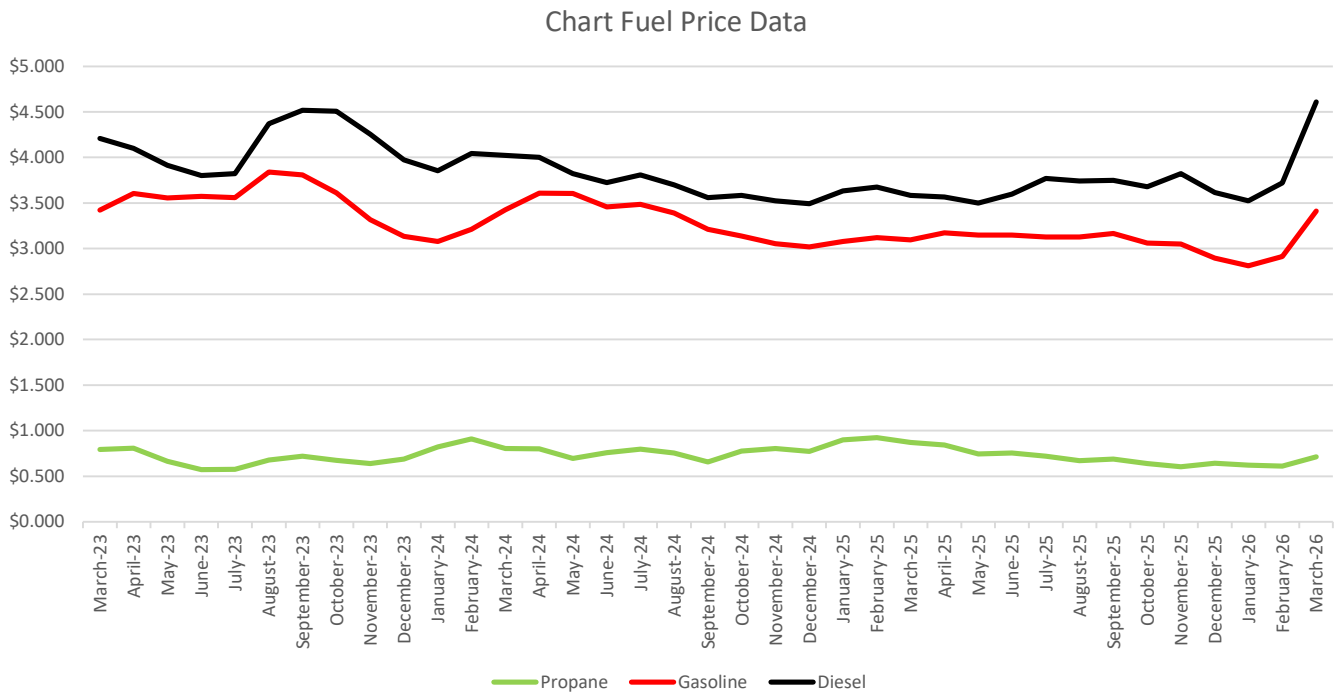
ROUSH CLEANTECH



Fuel Trends & Considerations

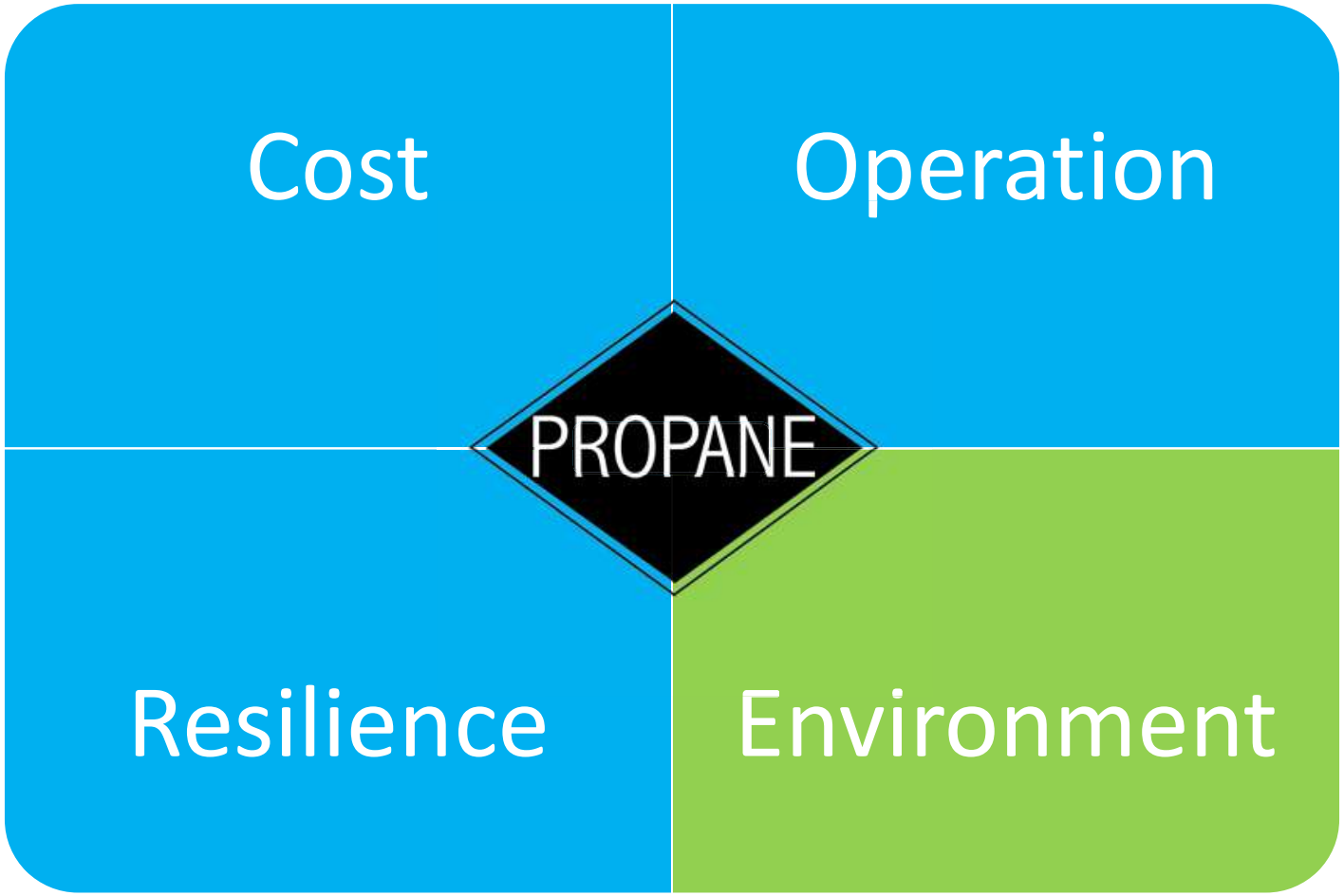
War, Tariffs & Exports

- Iran war severely impacting gas and diesel
- USA is largest exporter of propane
  - China historically takes 20% of annual US export
  - Seasonal port challenges
  - Some pathways blocked
- Inventory growing

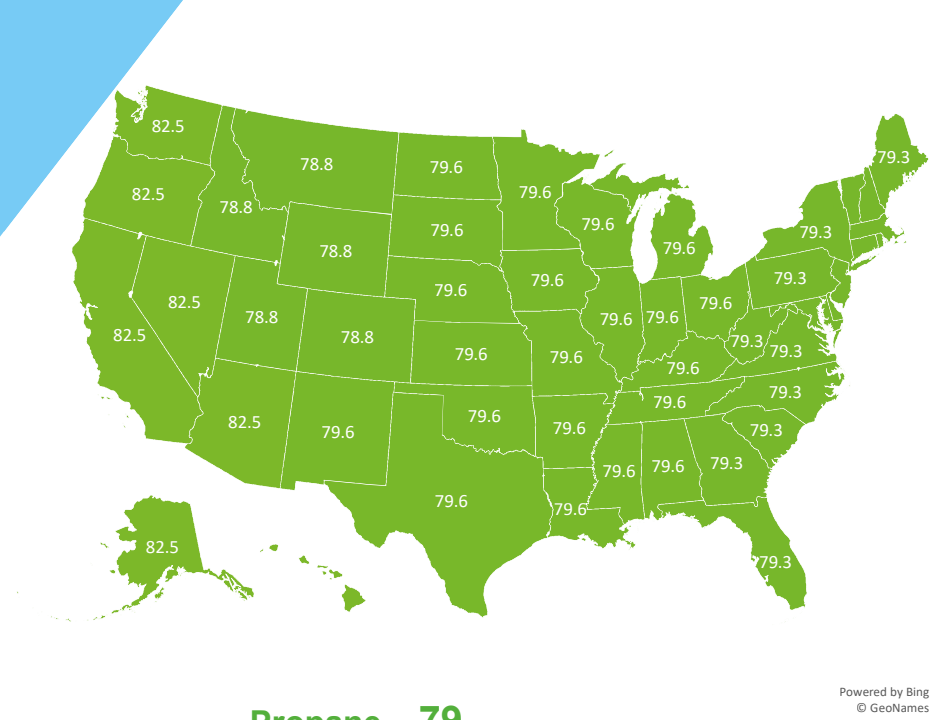


CORE Factors

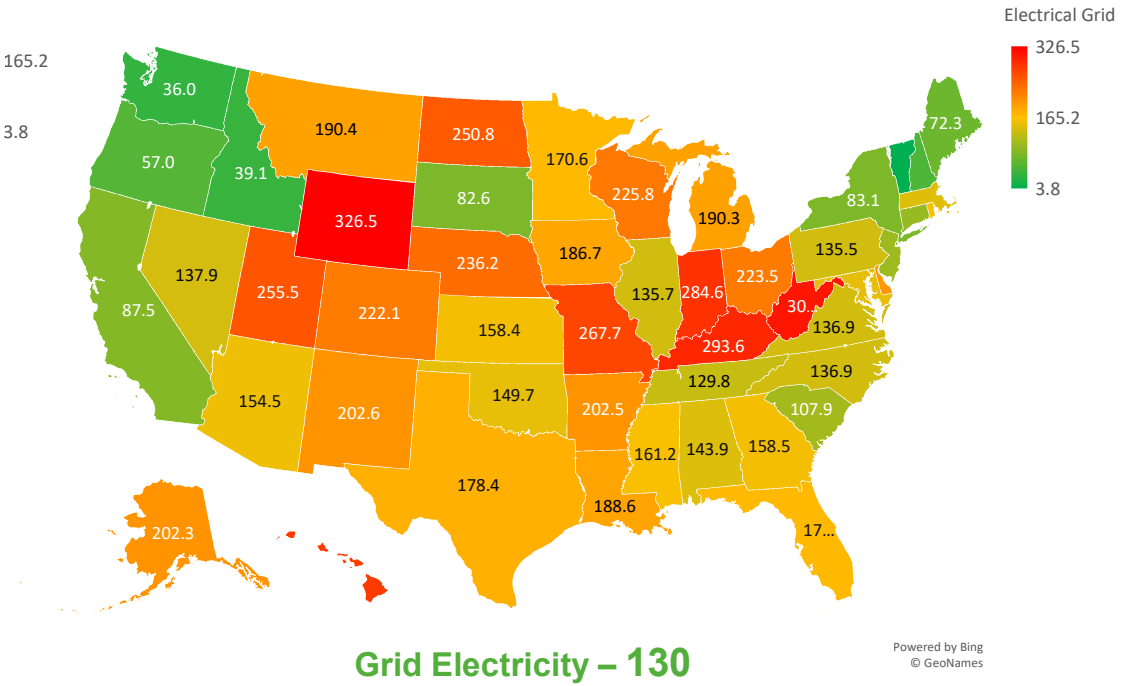
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Propane vs. Electric Grid



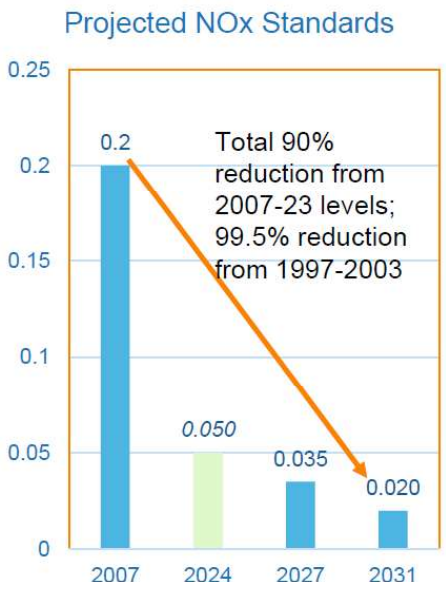
Propane – 79
(National Average)



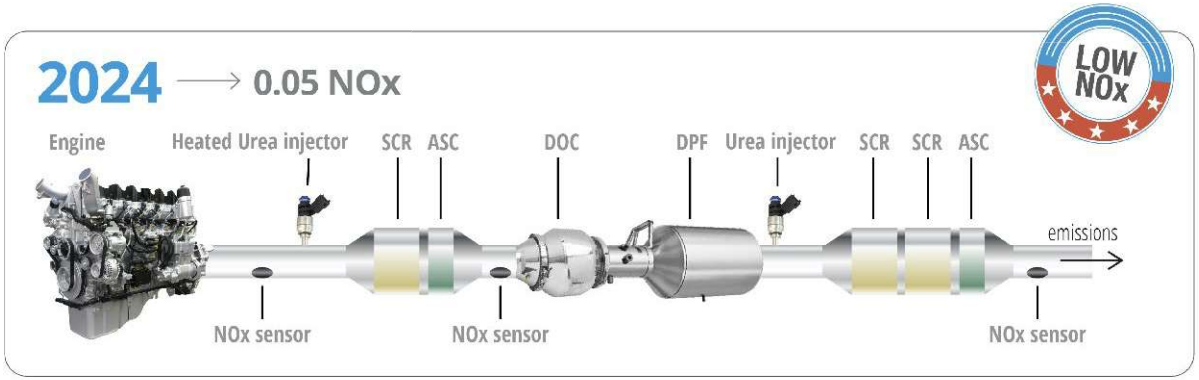
Grid Electricity – 130
(National Average)

What is Next for Diesel?

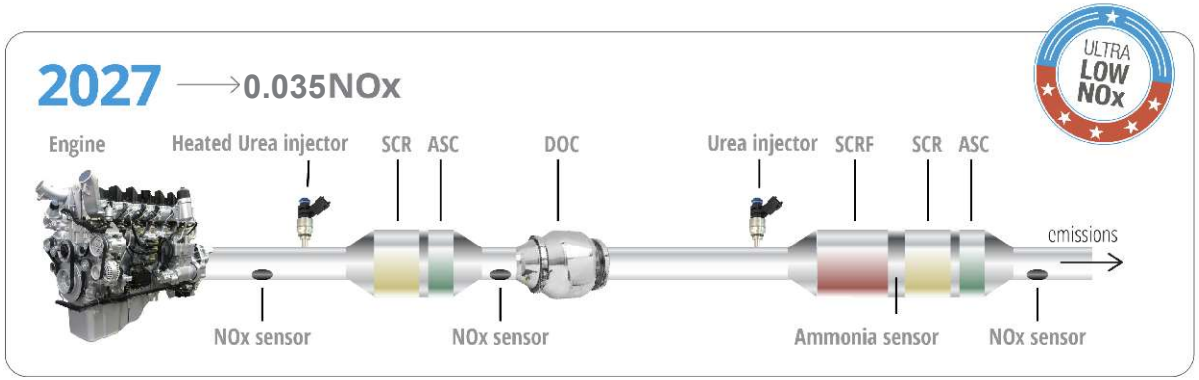
California Air Resource Board Heavy Duty Engine and Vehicle Omnibus Regulations passed into law in 2021



Source: "ESTIMATED COST OF DIESEL EMISSIONS-CONTROL TECHNOLOGY TO MEET FUTURE CALIFORNIA LOW NOX STANDARDS IN 2024 AND 2027" https://www.roushcleantech.com/The_Future_of_Emissions_February_2022.pdf



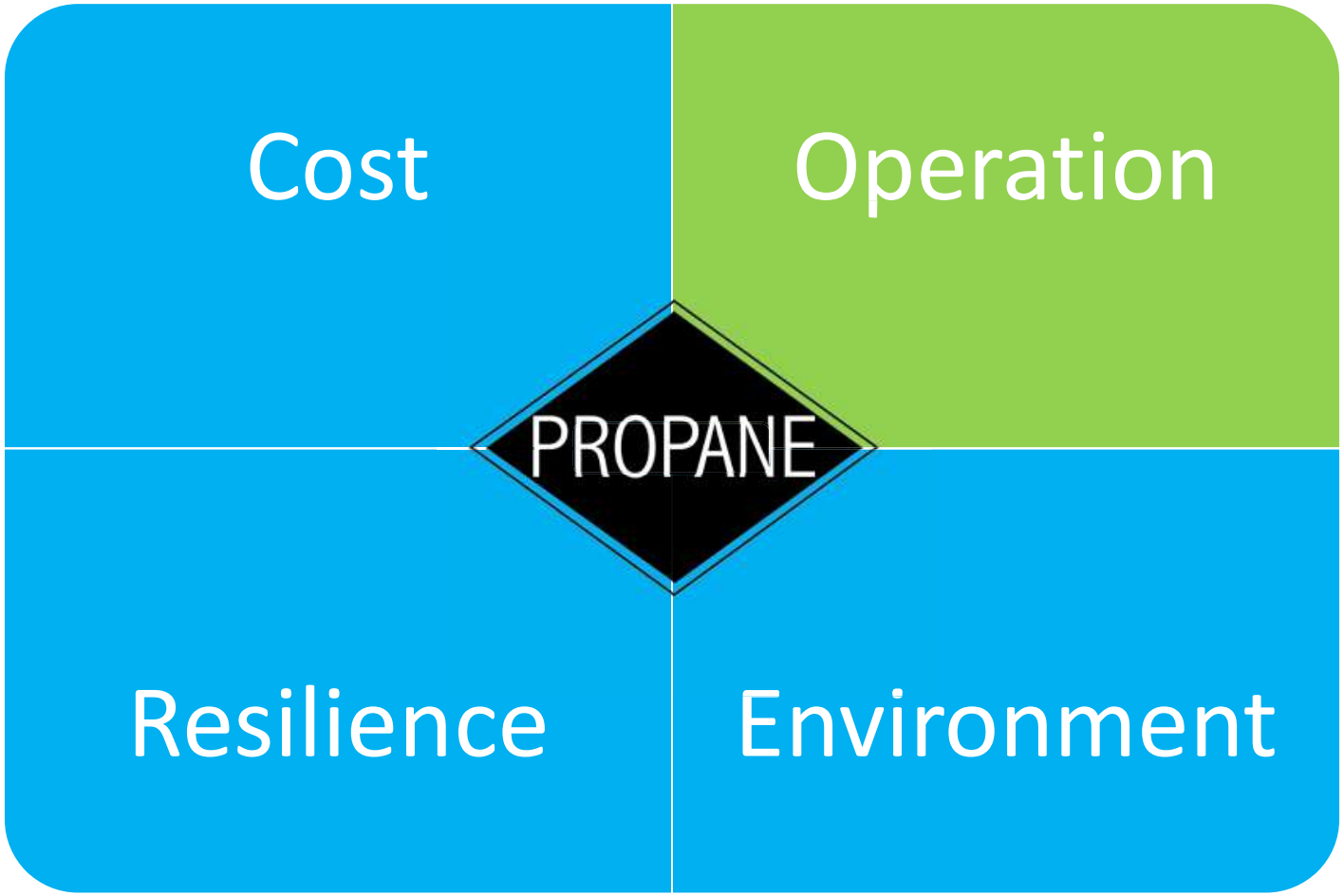
ROUSH CleanTech's propane autogas vehicles meet CARB's **2024** standard.



ROUSH CleanTech's propane autogas vehicles meet CARB's **2027** standard.

CORE Factors

ROUSH CLEANTECH



7.3L V8 Engine Stats

LEANER

CLEANER

MEANER



7.3	
Engine RPM	**Power**
Idle: 680 / Max: 4,050	HP: 335 / Torque: 468 ft-lbs. @ 3,900 RPM
Design	**Compression**
90° V8 / 445 CI / Pushrod 2V	10.5 to 1

7.3L Scale

Class 2 – 7

High Volume

- >1000 / day
- 6X Competition

Wide Vocational Usage

- Parts
- Support
- Experience



BUILT Ford TOUGH

Lifecycle

ROUSH CLEANTECH

We've been around the block…

- School bus retirement age usually starts around **12 years of age**, region dependent.
- Full lifecycle observed at several districts; **Tippecanoe**

Over

4,000

units over

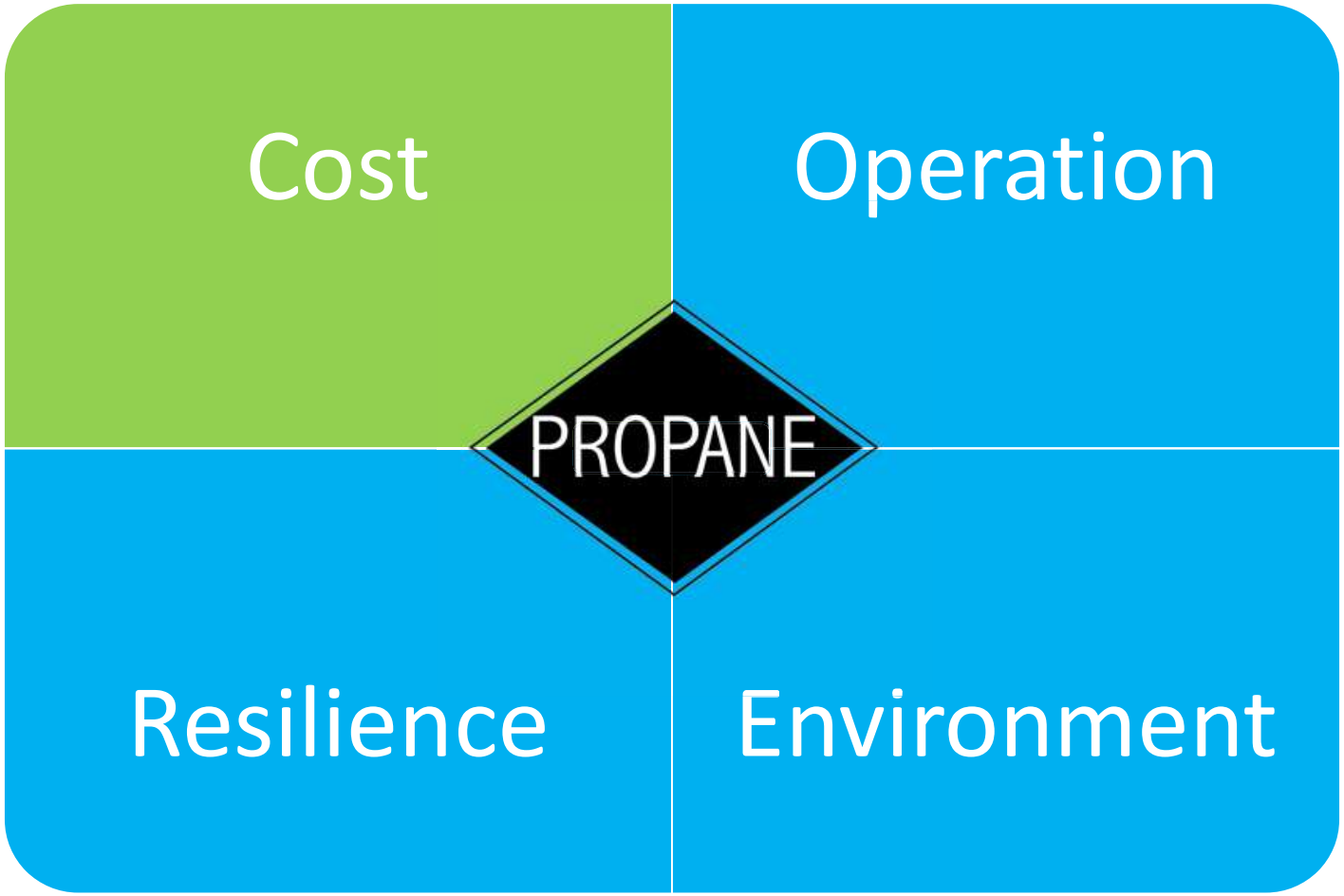
10 years

of age



CORE Factors

ROUSH CLEANTECH



NY State SD - Comparison

Bus	AVG FE	Fuel Price	CPM (Fuel Only)	Savings per Mile
Diesel	**5.21 mpg**	**$3.95**	$0.75	
Propane	**3.30 mpg**	**$1.35**	$0.41	$0.34

45%



$70,000 in lifetime savings at snapshot levels.

Maine FY24- Comparison

Bus	AVG FE	Fuel Price	CPM (Fuel Only)	Savings per Mile
Diesel	**8.0 mpg**	**$3.69**	$0.46	
Propane	**4.8 mpg**	**$1.46**	$0.30	$0.16

34%

$91,982.24 saved in FY24 on fuel only over 33 buses.



WaNee – Bulk Tank

Bus	AVG FE	Fuel Price	CPM (Fuel Only)	Savings per Mile
Diesel	**7.34 mpg**	**$3.79**	$0.52	
Propane	**4.50 mpg**	**$1.09**	$0.24	$0.28

53%

$60,000 / bus in lifetime savings at snapshot levels.



Savings Calculation (vs. Diesel)

ROUSH CLEANTECH

ROUSH CLEANTECH		PROPANE	Rebates	GAS	D	
FUEL						
Annual Miles per Bus		12,000		12,000	12,000	12,000
Years Operated		10		10	10	10
Total Miles Lifetime Miles per Bus		120,000		120,000	120,000	120,000
Fuel Economy (mpg)		5.00		6.00	9.00	2.08
Gallons Used Annually per Bus		2,400		2,000	1,333.00	663
Gallons Used Total per Bus		24,000		20,000	13,333.00	6,628
Fuel Price / Gallon		$1.70	$1.70	$3.49	$4.00	$4.52
PREVENTATIVE MAINTENANCE						
Oil Interval		5,000		5,000	7,000	10,000
Oil Capacity (Quarts)		8		8	21	3
Oil Filter Cost		$5.00		$5.00	$9.36	
Cost per Oil Change		$25.00		$25.00	$61.86	$7.50
Lifetime Oil Change Total Cost		$600.00		$600.00	$1,060.46	$90
DEF Lifetime Cost					$1,008	
Fuel Filters Change Interval		50,000			15,000	
Fuel Filters Cost		$160			$12.99	
Total Filters Changes		2			8	
Fuel Fiter Cost Lifetime		$320			$103.92	
Total Cost		**Propane**	**Propane**	**Gasoline**	**Diesel**	**EV**
Lifetime Cost		**$41,720**	**$41,720**	**$70,400**	**$55,504.35**	**$30,042.00**
Lifetime Savings		**$13,784**	**$13,784**	**-$14,896**		$25,462
Cost per Mile		**$0.35**	**$0.35**	**$0.59**	$0.46	$0.25
			Grants			**Grants**

Fuel		**Propane Fuel Price**	**Diesel Fuel Price**
		$1.70	**$4.00**
		Gasoline Fuel Price	**Electricity kWh**
		$3.49	**$0.12**
MPG		**Propane MPG**	**Gasoline MPG**
	↙	**5.00**	**6.00**
	56%	**Diesel MPG**	**EV Efficiency kWh/Mile**
	↖	**9.00**	**2.08**
Vehicle		**Years Operated**	**Gasoline Bus Price**
		10	**$0**
		Annual Miles per Bus	**Diesel Bus Price**
		12,000	**$0**
		Propane Bus Price	**EV Bus Price**
		$0.00	**$0.00**
Grants		**LPG Fuel Rebate**	**EV Bus Grant**
		$0.00	**$0.00**
		LPG Bus Grant	**Diesel Bus Grant**
		$0.00	**$0.00**

Fueling Freedom

- Less complexity
- Value priced
- Reduced emissions
- Easy infrastructure
- Safe
- Built-in resiliency
- No compromise in range or performance

PROPANE





THANK YOU

Todd Mouw

EVP, Sales, Marketing & Service

ROUSH CleanTech

todd.mouw@roush.com

ROUSH® CLEANTECH

BLUE BIRD®

Joel Stutheit from Propane Education & Research Council (PERC) on Propane Emissions and Costs

Propane Education & Research Council

Connecticut School Bus Alternative Fuels Working Group

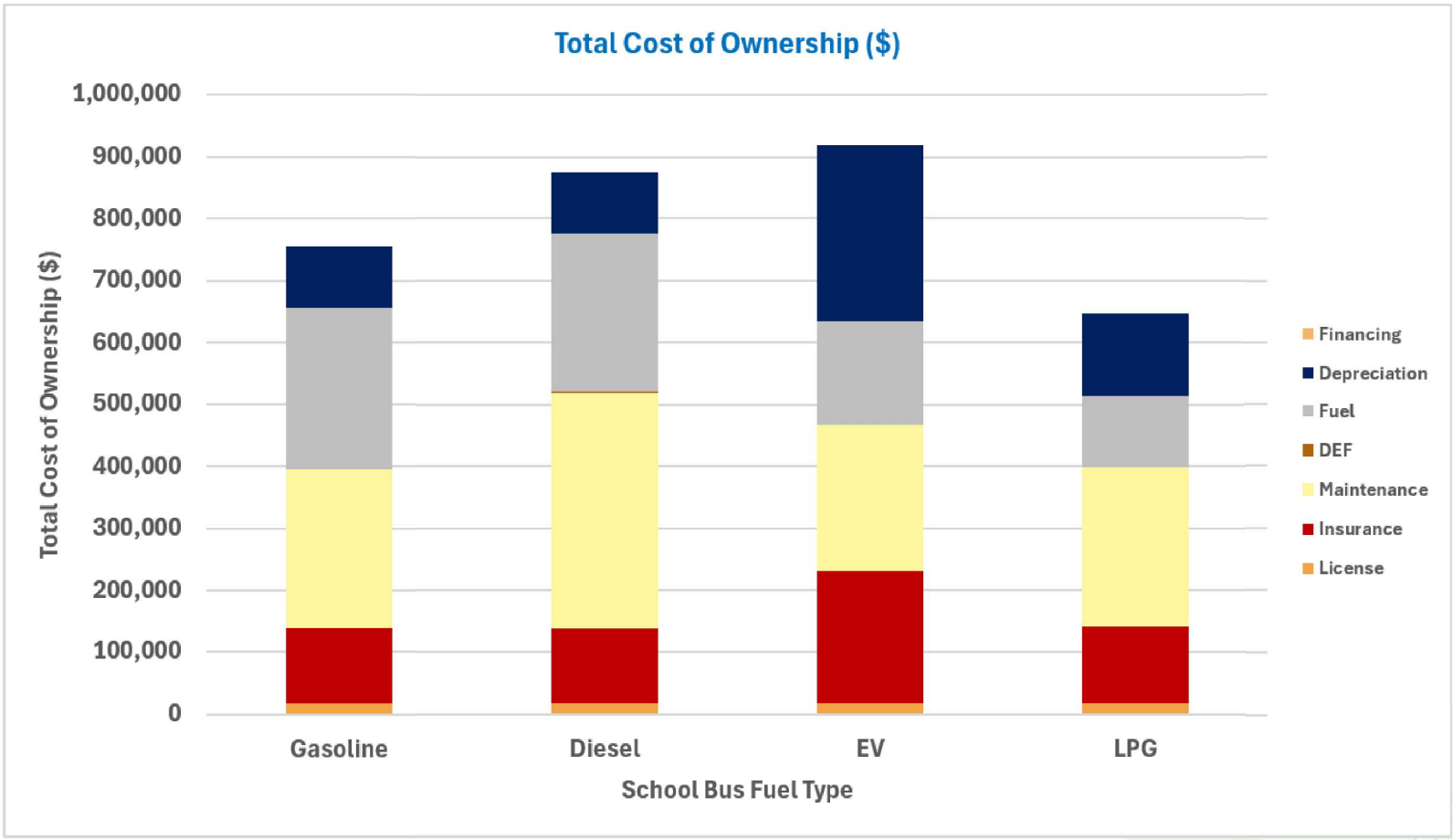
Joel Stutheit, senior manager, autogas business development

September 16, 2026

ENERGY FOR EVERYONE propane

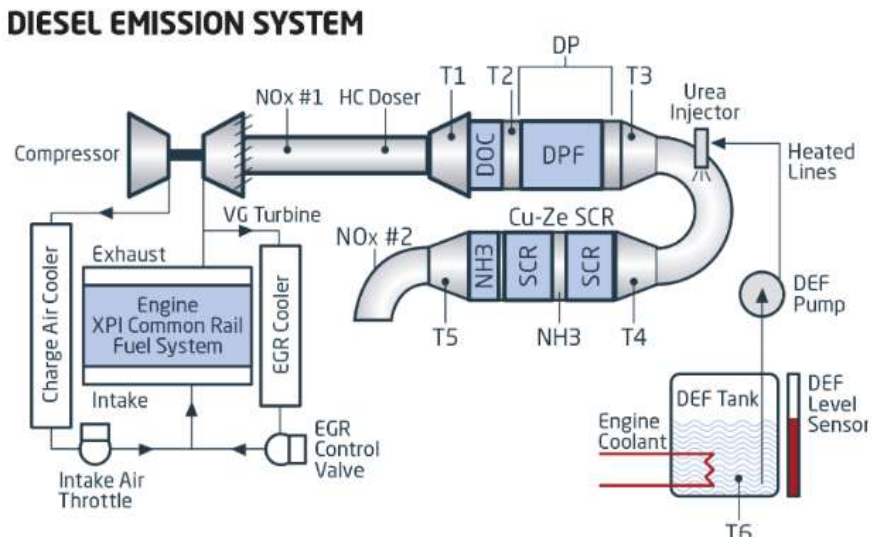


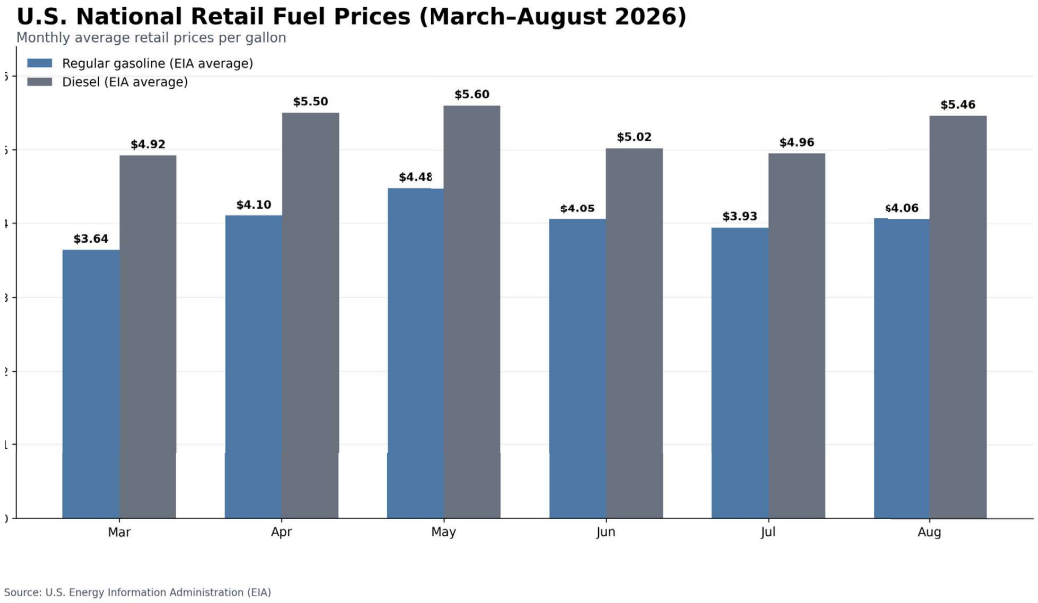
Best-In-Class Total Cost of Ownership



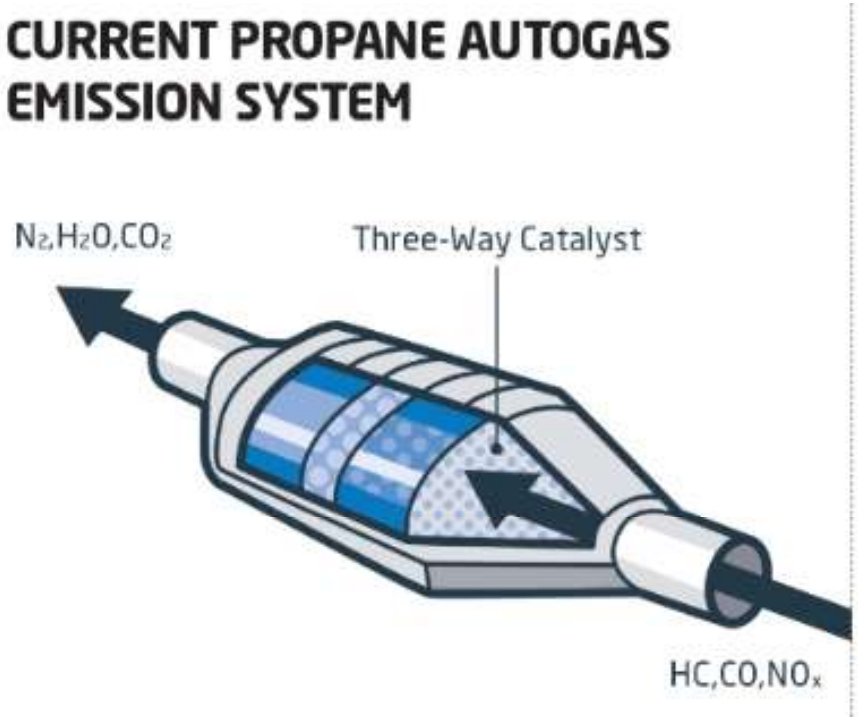
Resource: AFLEET Data 2024

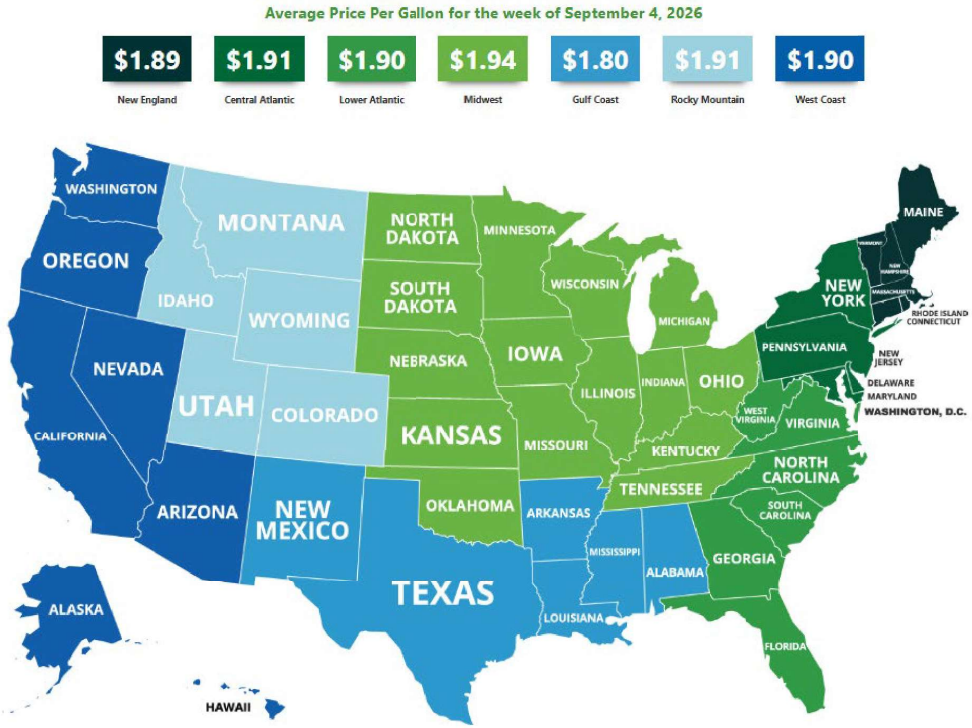
Complexity of Diesel





Simplicity Propane Autogas





Source: Alliance Autogas

Real World Data

School Bus Emissions Analysis									
Fuel Type	Emission Species	Real World Testing	Emissions Factors by Vehicle Model Year						
		MY 2025 Bus	MY 1990	MY 1995	MY 2000	MY 2005	MY 2010	MY 2015	MY 2020
Diesel	NOx (g/mile)	0.445	12.030	14.580	7.368	5.898	0.963	0.841	0.837
	PM (g/mile)	0.0008	0.695	1.026	0.436	0.405	0.015	0.013	0.013
			% Reduction of Pollutant by Replacing Respective MY Diesel bus with New Propane Bus						
Propane	NOx (g/mile)	0.049	99.6%	99.7%	99.3%	99.2%	94.9%	94.2%	94.1%
	PM (g/mile)	0.0006	99.9%	99.9%	99.9%	99.9%	96.1%	95.5%	95.4%

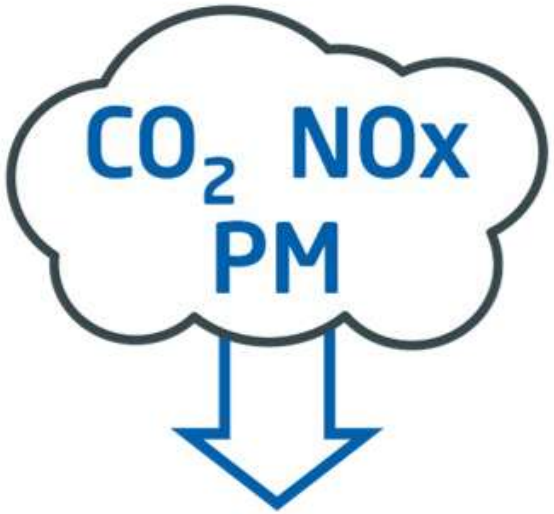
Path to Near-Zero Emissions

Ultra Low NOx

- Engines certified to 0.02 g/bhp-hr
- Below EPA27 threshold of 0.035 g/bhp-hr
- No changes needed to meet EPA27

Virtually zero PM

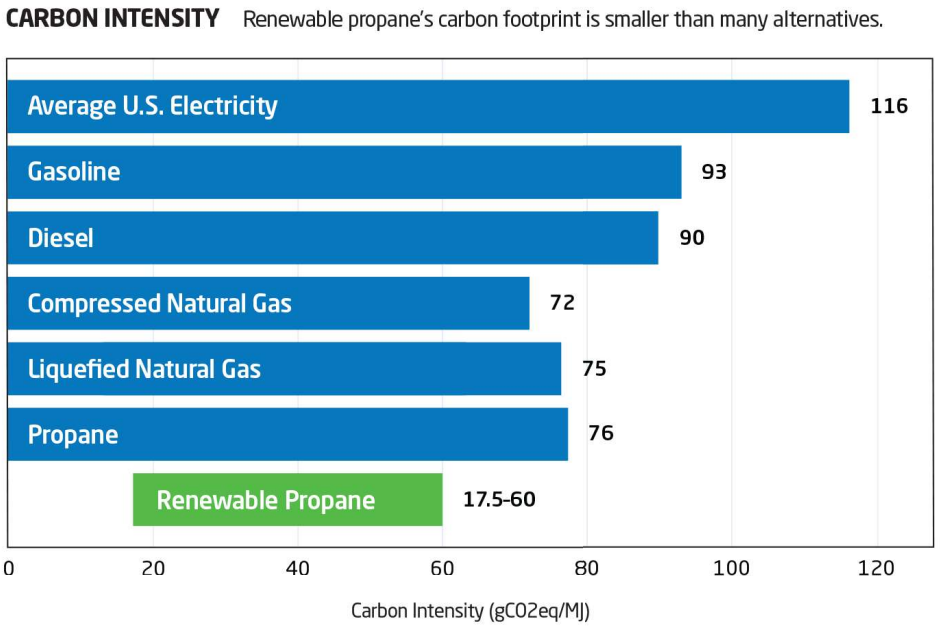
CO_2 reduction and Renewable Propane options

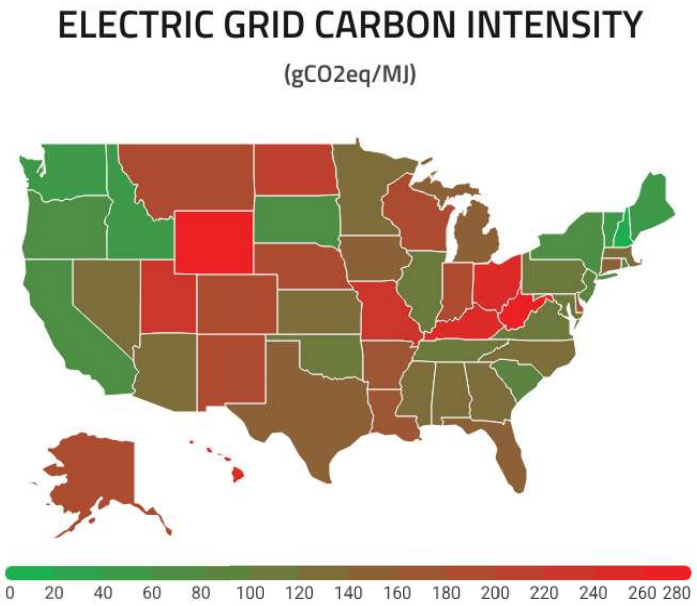


Simpler and Economical Pathway to achieve EPA27 Emissions Targets

- **No after-treatment complexities**
- **No Non-Conformance Penalties (NCPs)**

Practical Path to Lower Carbon





Fast, Affordable Refueling







Thank you!

Joel Stutheit

Senior Manager, Autogas Business Development

Propane Education & Research Council

joel.stutheit@propane.com

Johanna Zanvettor, Transportation Coordinator with Norwalk Public Schools

Norwalk Public Schools Transition to Propane

Johanna Zanvettor
Transportation Logistical Administrator

About Norwalk ……..



Our Transition

· It began in 2019 with an invitation to learn more

· Early 2020, NPS began a transition during COVID, we endured challenges

· Experienced approximately $90,200 savings in year 1

SY	per gal	cap	cost to district	# buses
19/20	2.17	108,000	$234,360.00	53
20/21	1.06	136,000	$144,160.00	58

· True partnership between vendors and services

· What our Fleet Manager says… "Run clean, less expensive to maintain, at 5 years just starting to put spark plugs, tenth of a price on an oil change as a diesel, ROUSH tech support top notch" "outside of the fuel line recall….I would choose propane over diesel any day"

NORWALK
Public Schools

Discussion and Questions

Next Steps

TIMELINE AND MEETING SCHEDULE

Event/ Deliverable	Date	Revised Topics (tentative)
Kickoff Meeting	July 29	Introduction and Scope
Second Meeting	August 19	Fleet Inventory, Technical and Emissions Analysis
Third Meeting	September 16	Propane School Buses Emissions and Case Studies
Fourth Meeting	October 14	Case Studies
Fifth Meeting	November 18	Economics, Procurement, Barriers, Pathways to Adoption
Sixth Meeting	December 16	Draft Recommendations
DEEP Staff Draft Report	By December 2026	
Draft Final Report	By Jan 1, 2027	For Workgroup Review
Final Meeting	January 13, 2027	Report Review
Final Report Due by February 1, 2027		