Zero-Emission Truck & Bus Pilot Commercial Deployment Project

Twin Rivers Unified School District

Project Timelines

- Began Workshop Discussions 6/01/2015
- ARB Solicitation Released 10/01/2015
- Grant Proposal due to ARB 1/29/2016
- Project Completion: 4/01/2019

Project Overview

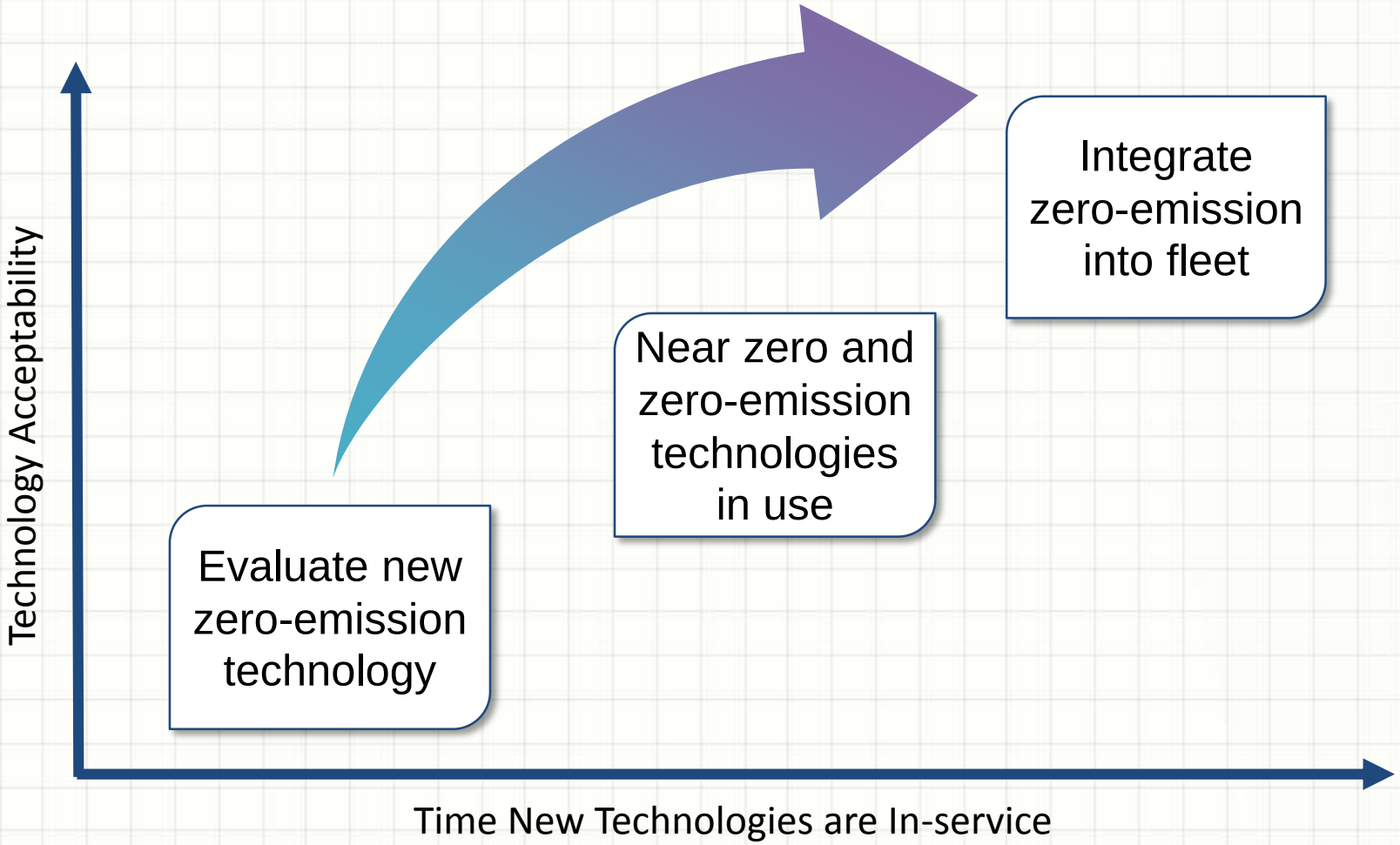
- Total deployment of 29 EV School Buses
- Twin Rivers Unified School District (16)
- Sacramento City Unified School District (3)
- Elk Grove Unified School District (10)

First and Largest Deployment to Date in the US.

Program Goals

- Benefit Disadvantaged Communities (DAC) with the introduction of Zero Emission School Buses.
- Demonstrate commercially available zero-emission technologies in school fleets.
- Accelerate the acceptance and use of zero-emission technologies.
- Upgrade of Fleet.

Regional Program Goals



Funding Sources

- This program is funded by AB 118 Air Quality Improvement Program (AQIP) and the Low Carbon Transportation Greenhouse Gas Reduction Fund (GGRF) Investments.

- $60 Million Cap and Trade Funds Administered through California Air Resources Board.

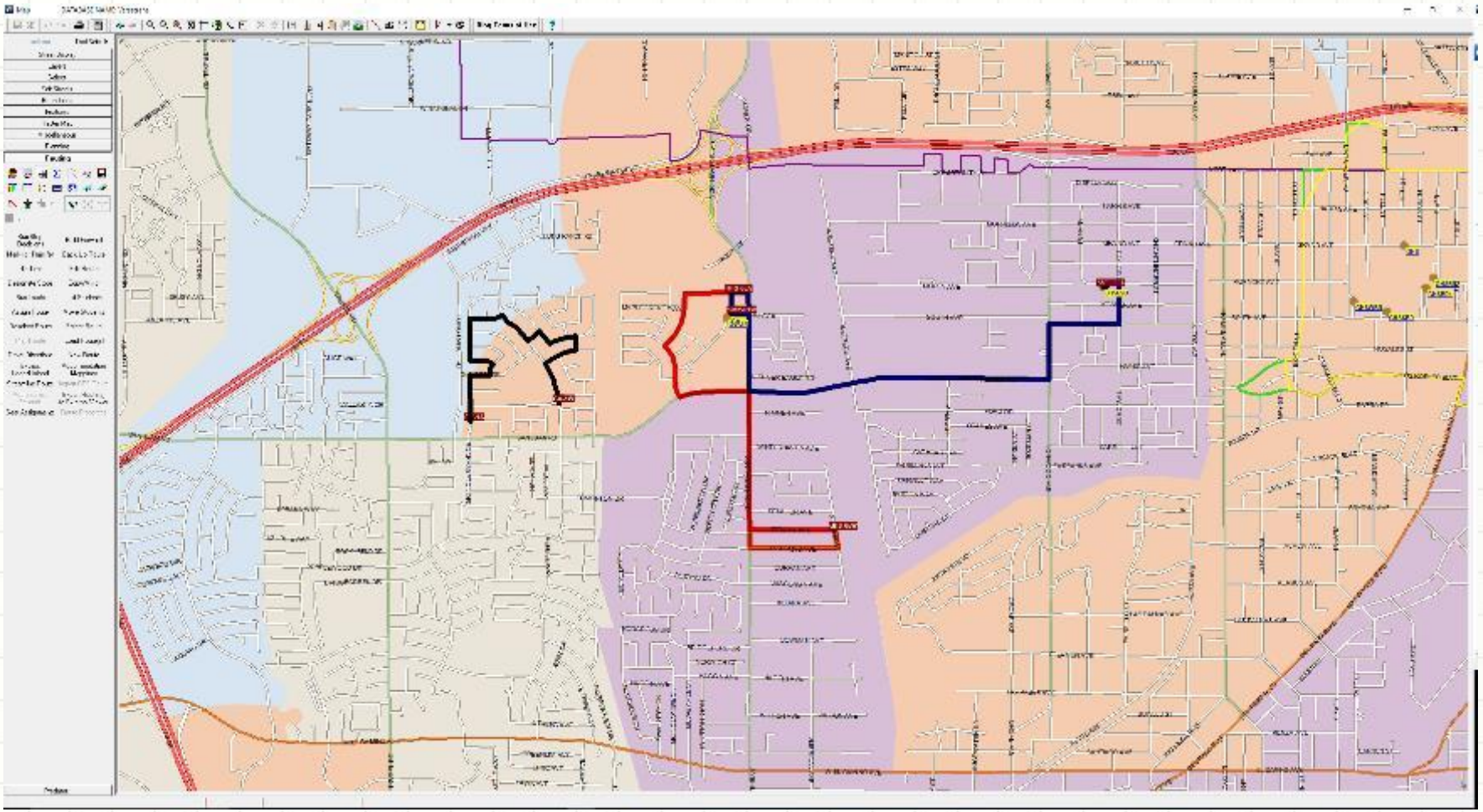
Funding Sources

- Sacramento Municipal Utility District (SMUD). Rebate on Charging Stations.
- Cash Match From the School District 10%.
- In-kind: labor, equipment, materials, equipment transportation, private financing, and federal or non-AB 118 and non-GGRF sourced state funds

Project Costs for Twin Rivers

Twin Rivers	Total	ARB Grant	SMAQMD Match	Twin Rivers Match	FPBS Supplement	(Verify)
% match		70%				
Cash						
Bus Lion Type C 100 - 65 pax	$1,640,832	$1,148,582	$240,000	$252,250		$1,640,832
Bus Lion Type C 75 - 71 pax	$1,617,084	$1,131,959	$240,000	$245,125		$1,617,084
Bus Trans Tech Type A	$2,095,880	$1,467,116	$320,000	$308,764		$2,095,880
Charge station Infrastructure and Data Mgmnt System	$460,319	$322,223		$134,527	$3,569	$460,319
Fuel Consumption Lion (2.5 years)	$33,264	$23,285		$9,979		$33,264
Fuel Consumption Trans Tech (2.5 years)	$20,196	$14,137		$6,059		$20,196
Service and Technical Support (2.5 years)	$72,000	$50,400		$21,600		$72,000
Subtotal Cash	$5,939,575	$4,157,702	$800,000	$978,304	$3,569	$5,939,575
InKind School District						
Bus Drivers	$1,080,000			$1,080,000		
Maintenance Lion (2.5 years)	$32,400			$32,400		
Maintenance Trans Tech (2.5 years)	$32,400			$32,400		
Admin: School District staff (2.0 years)	$360,000			$360,000		
Subtotal InKind School District	$1,504,800			$1,504,800		

Analysis of Current Bus Routes



Disadvantaged Communities (DAC)

Cal/EPA defined DAC by combining pollution and population factors including, but not limited to:

- Areas disproportionately affected by environmental pollution and other hazards that can lead to negative public health effects, exposure or environmental degradation.
- Areas with concentrations of people that are of low income, high unemployment, low levels of home ownership, high rent burden, sensitive populations, or low levels of educational attainment.

Disadvantaged Communities Maps

This map shows the disadvar communities designated by C for the purpose of SB 535. Th areas represent the 25% high scoring census tracts in CalEnviroScreen 2.0.

Additional information on SB available at the CalEPA webs

CalEnviroScreen 2.0 informat including a detailed descriptic indicators and methodology is at the OEHHA website.

http://oehha.maps.arcgis.com/apps/Viewer/index.html?appid=dae2fb1e42674c12a04a2b302a080598

Projects **IN** Disadvantaged Communities

- **Based on the state-wide competition for funds, projects IN a DAC will be the most likely participant for FY 2014-15 funds awarded by the California Air Resources Board.**
- At least 25% GHG Reduction Funding (GGRF) must benefit Disadvantaged Communities.
- At least 10% GGRF must be allocated toward projects IN Disadvantaged Communities.

Project Selection for Submittal

- School district routes must be predominantly in a DAC.
- Awarded funding will be scaled to support DAC and cost-effectiveness benefit.

Infrastructure


SCHOOL BUS
eLion

Keys to Success

- Develop Relationships with All Partners and Potential Partners.
- Know your Roles.
- Embrace the Technology through Education.

Conceptual Transportation Fleet

Green Fleet Initiative

Getting to Know the Transportation Department

- Transports over 12,000 students daily
- Owns 150 buses
- Our drivers travel over 2.3 MILLION miles a year
- Employs 216 drivers and aides, and 4 mechanics

Current Limitation and Liability

The North Kansas City Schools Transportation fleet is aging rapidly - to the point that several of our buses are costing more in maintenance and repairs than they are worth.

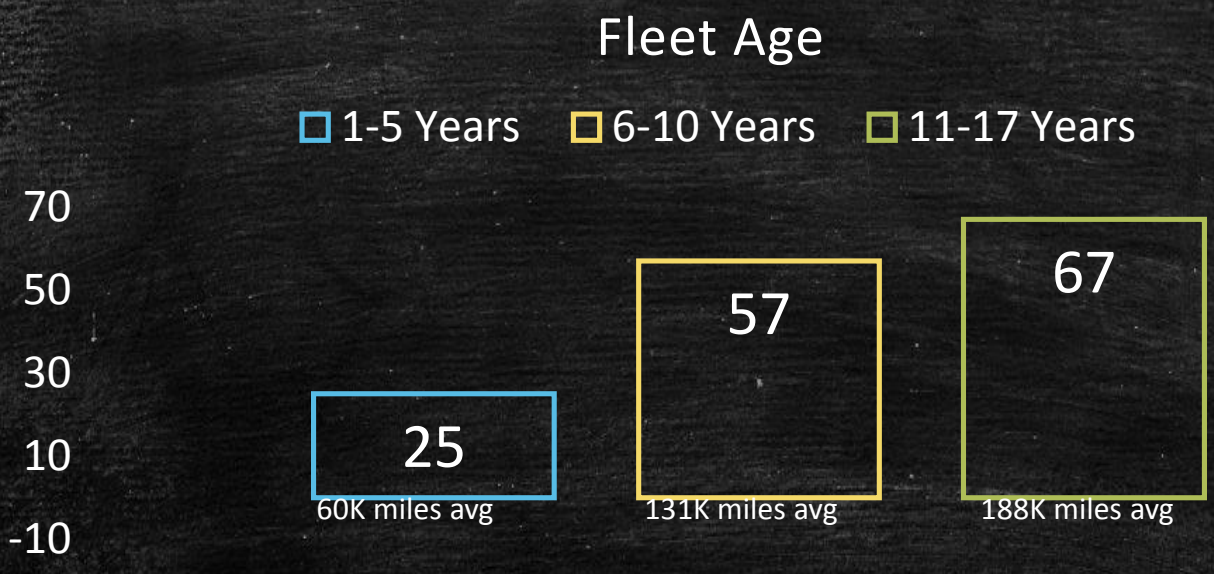
In addition, the district continues to grow and increase programing for students thus requiring more buses and drivers.

Current State of the Fleet

- Aged beyond the industry standard
- Extremely high maintenance cost
- Bus reliability concerns

	North Kansas City Schools	Industry Standard
Average Age	9.5 years	5.5 years
Average Fuel mpg	5.65 mpg	8 mpg
Annual Bus Cost Parts and fuel only	$13,427	$7,140

Current State of the Fleet



124 buses without warranty coverage – 83.3%
27 buses over 200,000 miles – industry standard is to replace at 150,000 miles

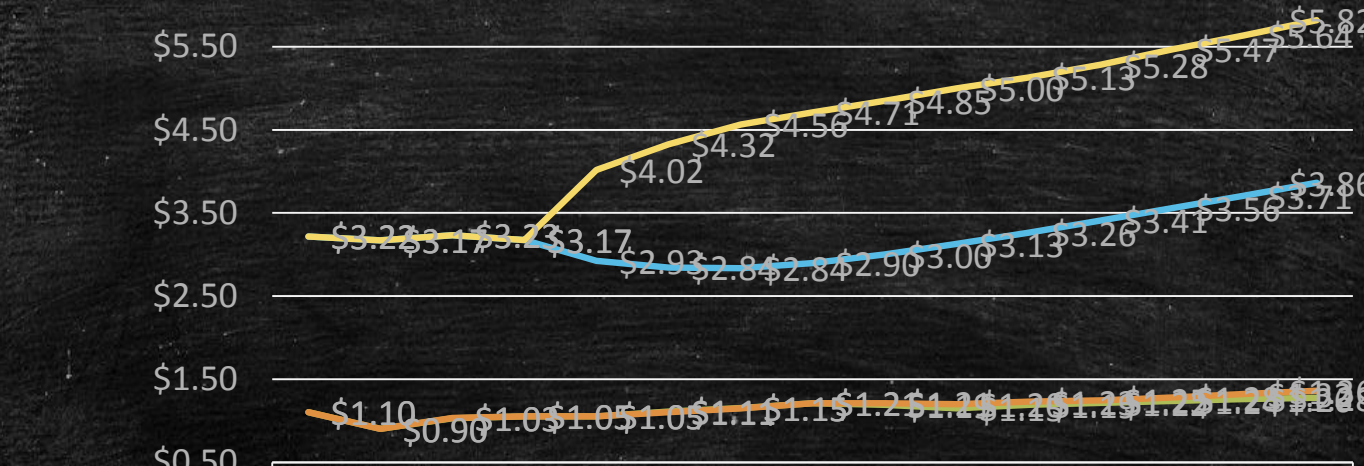
Possible Solutions to Correct Limitations and Reduce Liability

Hire More Mechanics and Increase Parts Budget	Purchase New Buses	Lease Buses
A Blended Approach of Leasing and Purchasing	Refurbish Buses	Green Fleet Initiative

What is Compressed Natural Gas (CNG)?

- Similar motor to our diesel buses
- Increased fuel efficiency
- Quiet
- Environmentally safe
- 3rd generation improved technology
- 300 year supply of domestic natural gas with a $0.13 variance

Cost of Fuel



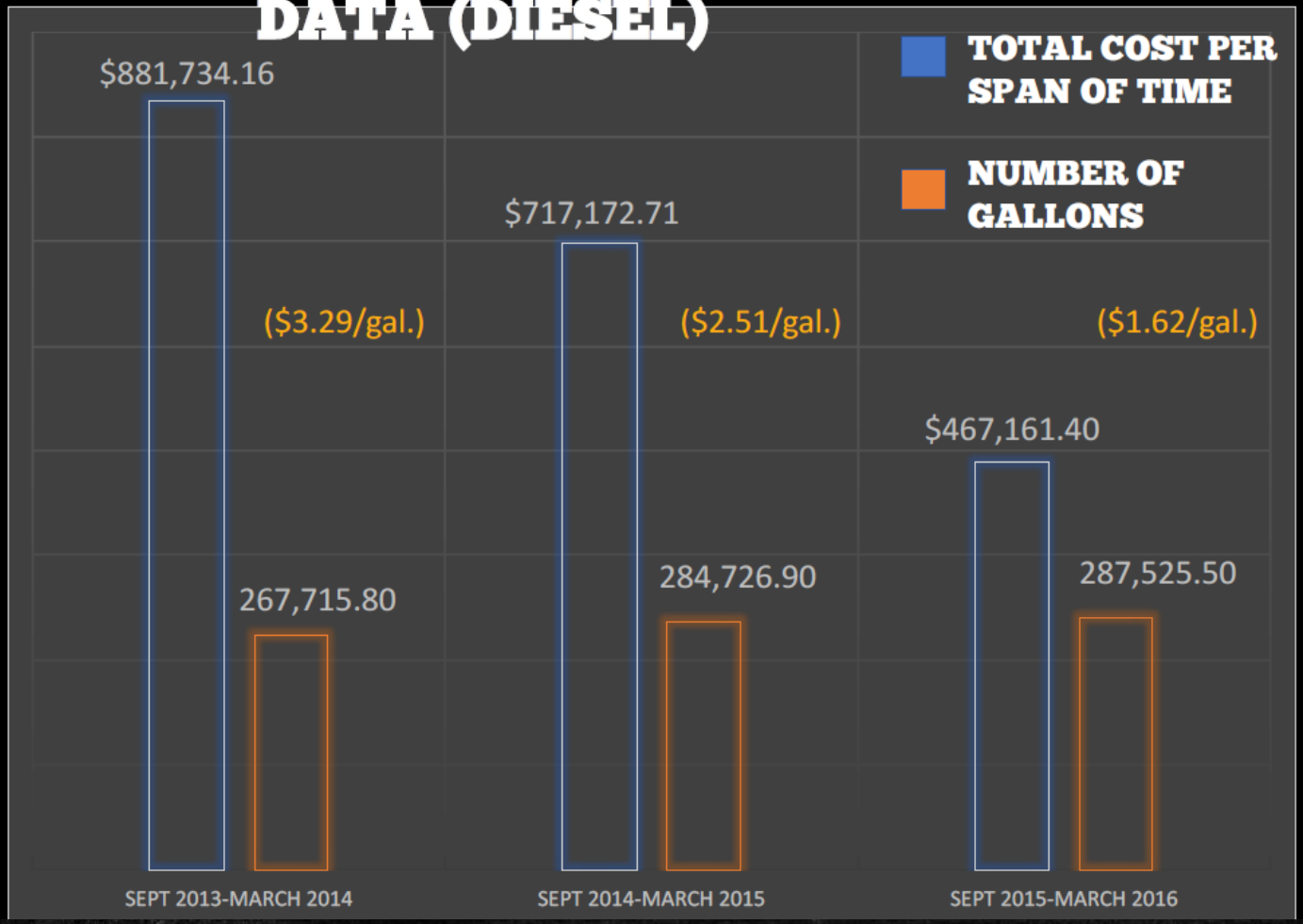
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Diesel - Low	$3.2	$3.1	$3.2	$3.1	$2.9	$2.8	$2.8	$2.9	$3.0	$3.1	$3.2	$3.4	$3.5	$3.7	$3.8
Diesel - High	$3.2	$3.1	$3.2	$3.1	$4.0	$4.3	$4.5	$4.7	$4.8	$5.0	$5.1	$5.2	$5.4	$5.6	$5.8
CNG - Low	$1.1	$0.9	$1.0	$1.0	$1.0	$1.1	$1.1	$1.2	$1.1	$1.1	$1.1	$1.2	$1.2	$1.2	$1.2
CNG - High	$1.1	$0.9	$1.0	$1.0	$1.0	$1.1	$1.1	$1.2	$1.2	$1.2	$1.2	$1.2	$1.2	$1.3	$1.3

(407,700 gallons annually)

Transportation UPDATE

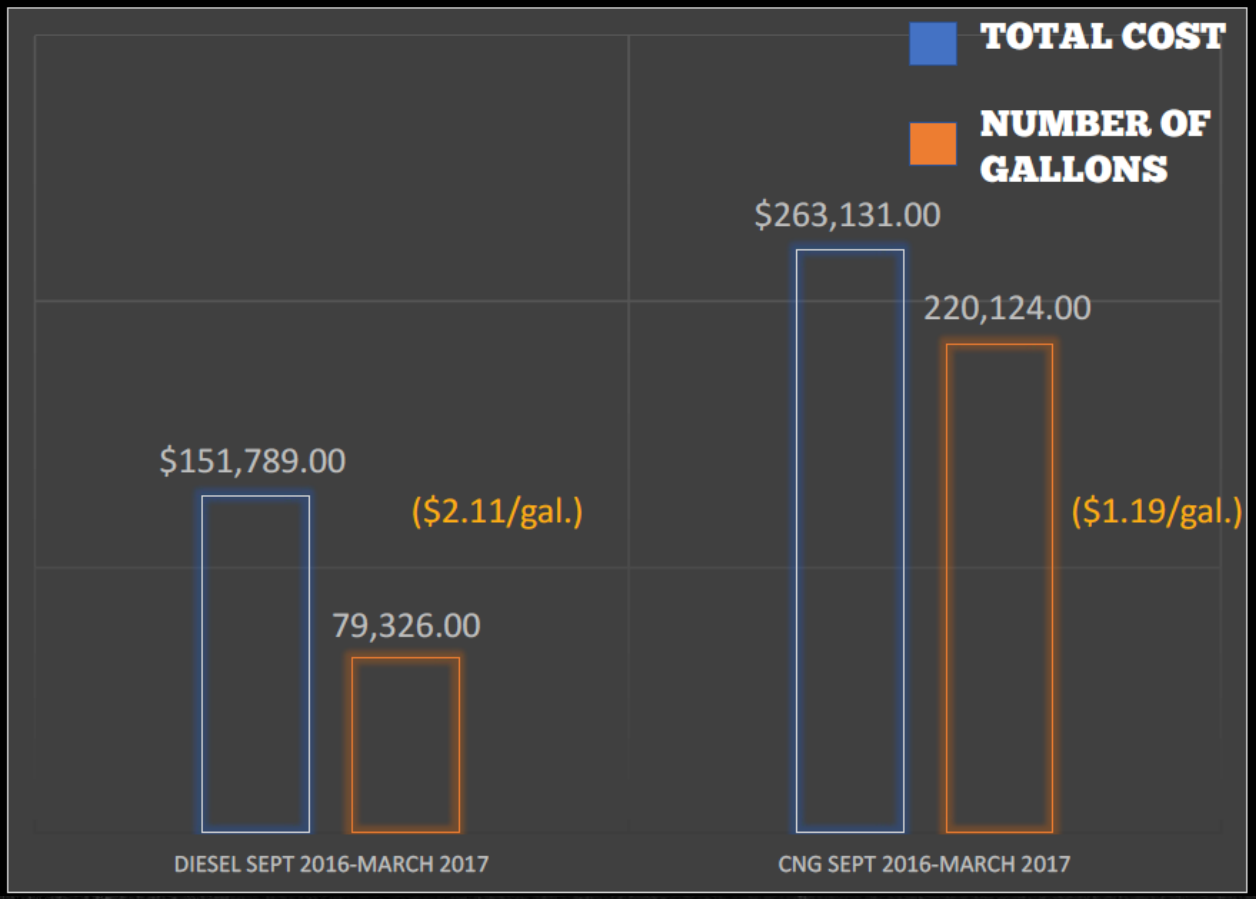
Historical

DATA (DIESEL)

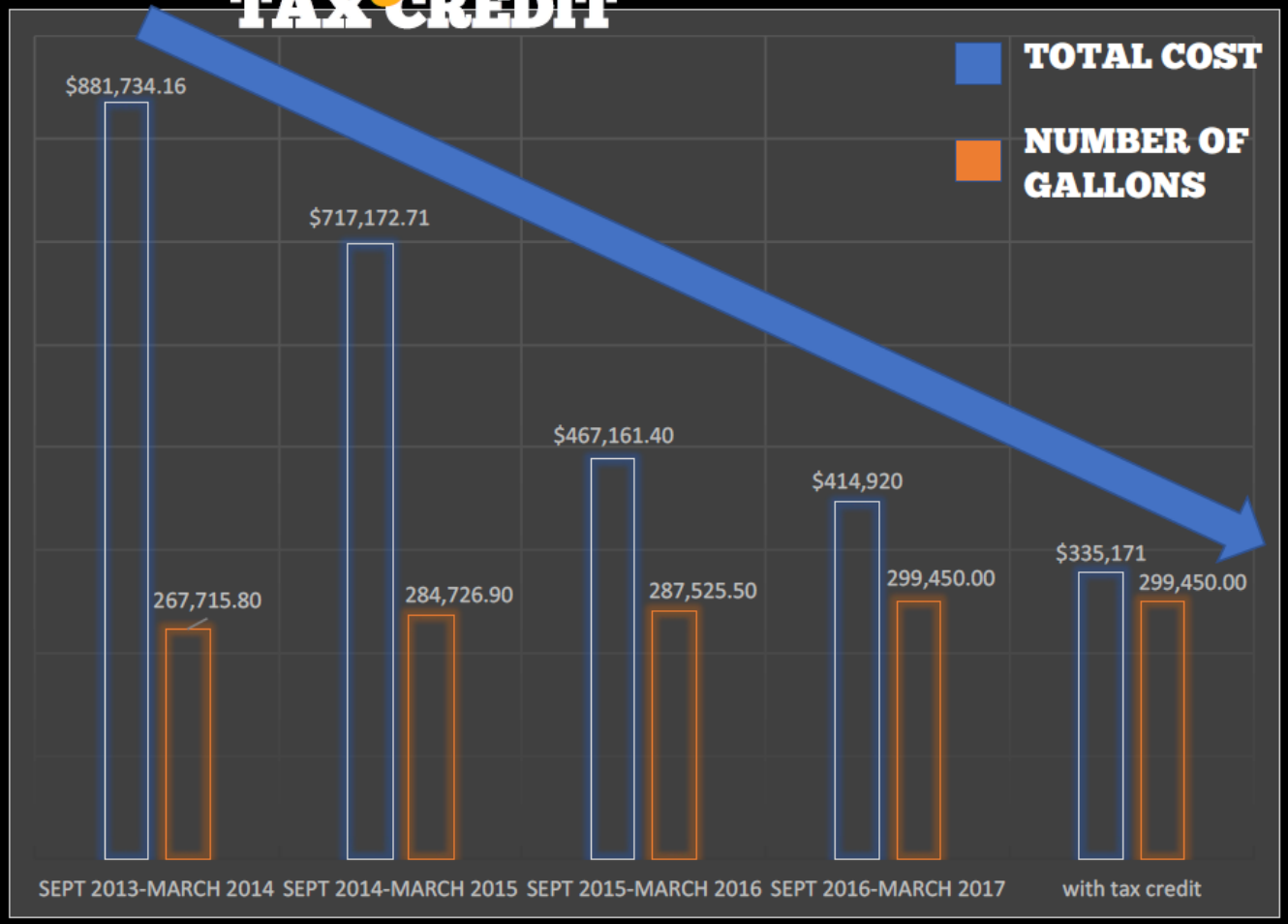


Current

DATA (DIESEL AND CNG)



Including TAX CREDIT



We drive the future. We are the difference. We are Prosper.

The Fastest Growing School Districts in the State of Texas (2010-2015) Minimum 5,000 students

Prosper ISD	95%
Frisco ISD	46%
Lubbock-Cooper ISD	42%
Northwest ISD	40%
New Caney ISD	35%

Our Growth

- **Distinguishing Characteristics**: Prosper ISD is one of the fastest growing districts in the State of Texas increasing approximately 100% in student enrollment every five years;
- **Safety and Security**: Prosper ISD employs its own Police Department and spares no expense to insure the safety of students, staff, and parents – Prosper ISD was recently ranked #1 as the SAFEST SCHOOL DISTRICT in the State of Texas for 2017, Ranked #8 Nationally. (NICHE Ratings)
- https://www.niche.com/k12/search/safest-school-districts/s/texas/

Growth Cont.

- Prosper ISD will enroll more than 13,000 students by 2018, and more than 16,000 students by 2019
- 5 year growth = 10,511 students
- 2021/22 enrollment = 20,509 students
- 10 year growth = 22,242 students
- 2026/27 enrollment = 32,240 students
- Current Enrollment= 12,119

2009 Initial Implementation of LPG/Propane Program

- Initial Purchase of 25 LPG Buses. (Bond Funding)
- Fuel Infrastructure. (18,000 Gallon Tank, 1 dispenser)-(Bond Funding)
- 2012- (2) Additional dispensers installed with additional fuel island. SECO Grant of $88,000 was awarded to Prosper ISD. Total cost of project was $122,000 (approx.)

18,000 Gallon Tank

Initial Dispenser

2012 Addition

Fuel Connection

Current Fleet

- 137- School Buses
- 130- LPG
- 7-Diesel
- All Blue Bird Visions
- 67- LPG buses with 98 Gallon Capacity.
- 63- LPG buses with 66 Gallon Capacity. (early models).

Routing

- **Special Needs**
- 24 total buses
- 16 used
- 36 routes

- **Regular**
- 64 total used
- 132 routes

- 88 buses used for Home to School and growing
- 10% are 3-tier routes, 90% are 2-tier routes.

Avg. Fuel Cost

- 2015- $0.57/Gallon ($4.9175 CPM) State Report
- 2016- $0.77/Gallon ($ 5.4527 CPM) State Report
- Fuel rebate from IRS not part of the Avg. yearly cost. $0.50/gallon rebate. Not always available.
- 2015 IRS rebate on LPG- $117,854.50
- 2016 IRS rebate on LPG- $121,756.50
- Fuel Suppliers Monitor levels via Skytracking
- Fuel Monitoring- Fuel Master
- Fuel Team of 6 drivers fuel between routes.

Upcoming Projects

- **HS #2- 2020-** Satellite transportation facility complete with LPG fueling.
- **HS#3- 2022-** Satellite transportation facility complete with LPG fueling.
- Projected 5-7 total HS sites at build out. Each HS site will have transportation facility and LPG fueling along with Diesel and Unleaded fueling capability.
- Funding will be through Bond Program.

Contact Info

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0-469-219-2065

ROUSH CLEANTECH

Near-Zero Emission Propane Autogas Engines

Enterprise Brand Portfolio

ROUSH Industries
OEM manufacturing, engineering, prototyping and design

Roush Fenway Racing
NASCAR racing team(s)

ROUSH Performance
Industry leading high performance vehicles

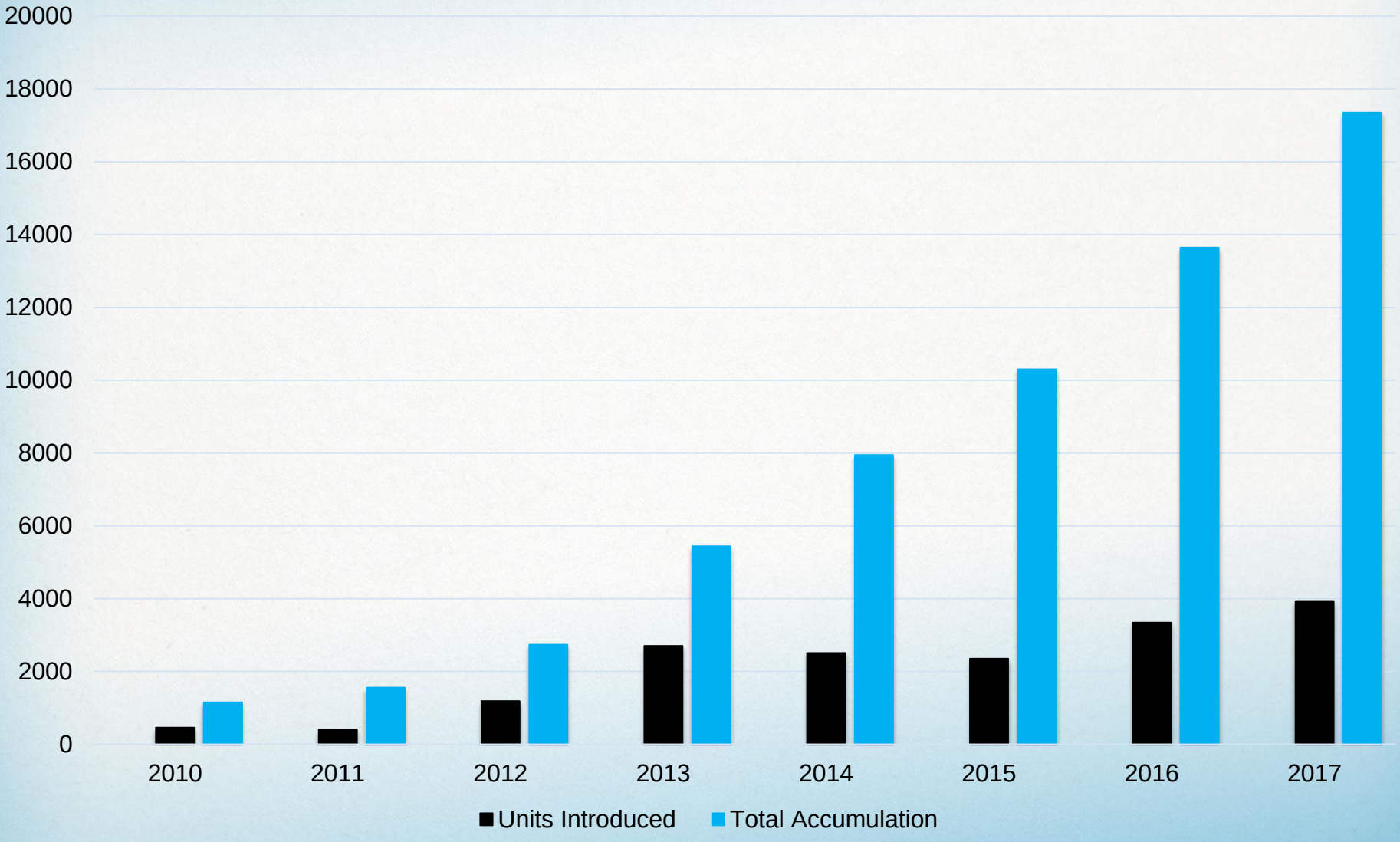
ROUSH CleanTech
Propane autogas powered commercial vehicles.

ROUSH CleanTech

- 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.

ROUSH CLEANTECH

Units in Operation



ROUSH CLEANTECH

Our Scorecard

QVM QUALIFIED VEHICLE MODIFIER

OVER

17,500

VEHICLES ON THE ROAD

ACCUMULATED OVER

430

MILLION MILES

OVER

720

SCHOOL DISTRICTS

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

ROUSH CLEANTECH

ULTRA LOW
NO_X EMISSIONS

Drive for Reduced NOx

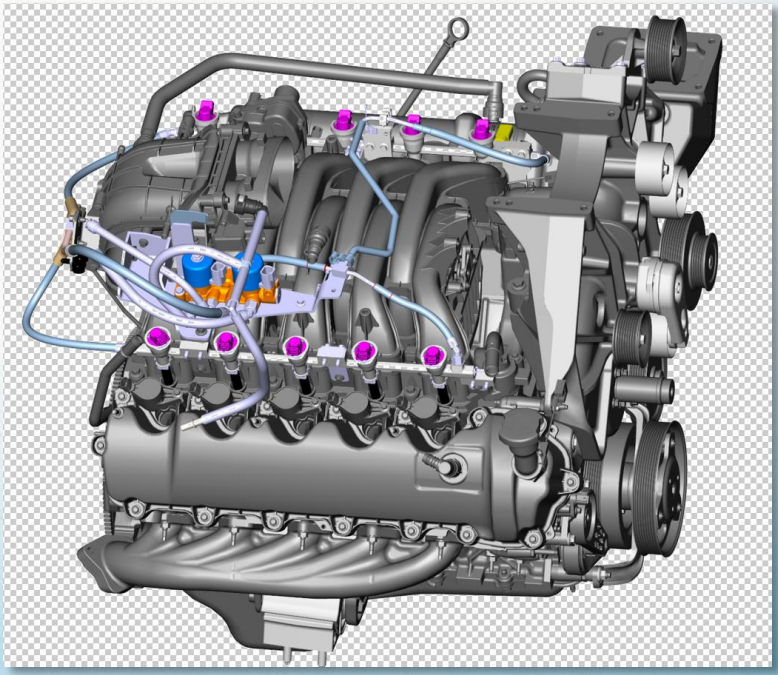
- ARB is encouraging all Manufacturers of Record (MORs) to overachieve on the NOx standard to support smog reduction.
- ARB has issued alternative standards at 0.1, 0.05 and 0.02g/bhp-hr for NOx.
- The recent VW settlement also includes funding that supports NOx reductions across all 50 states that off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

Production Powertrain

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.



RCT Status of Low NOx

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

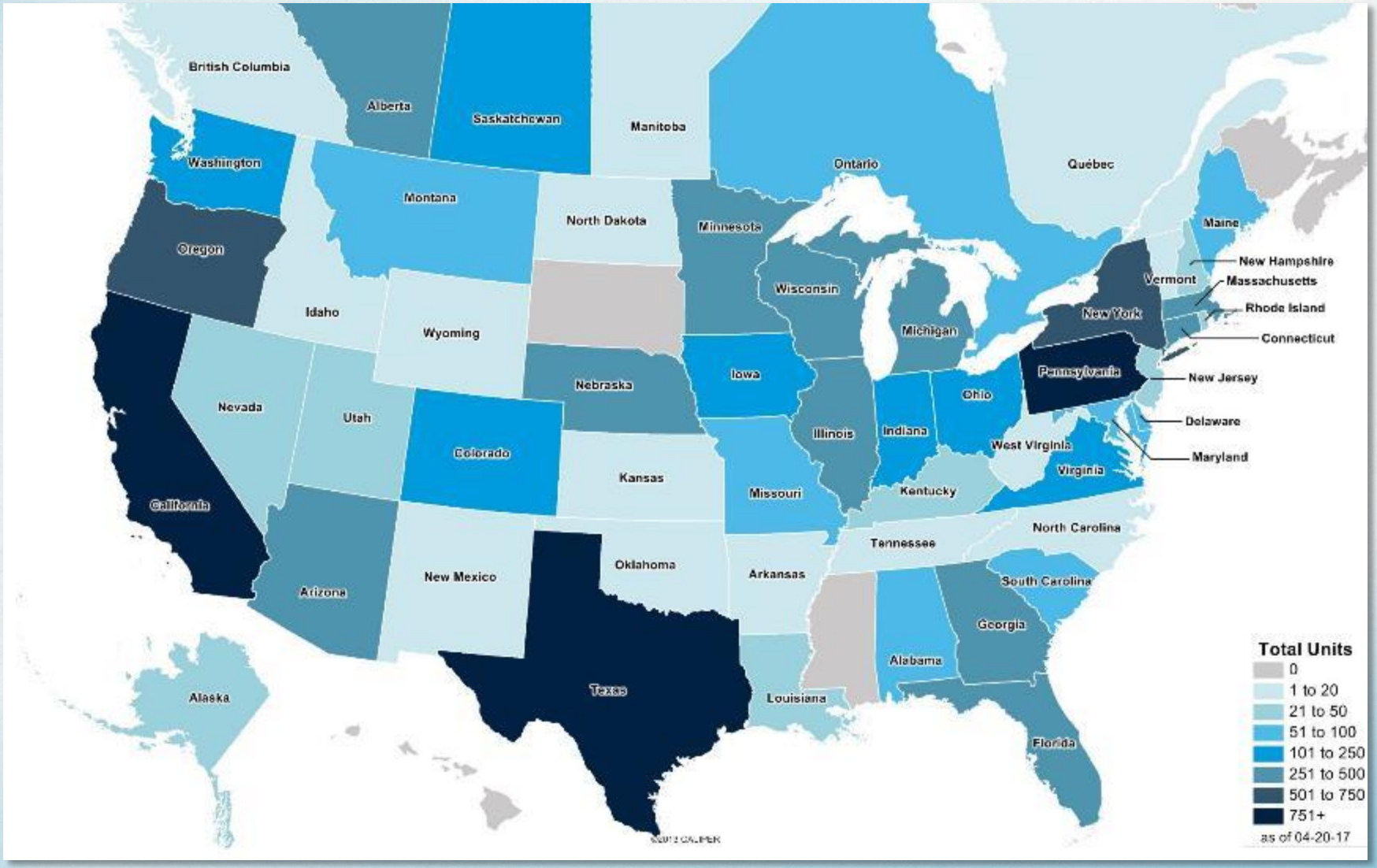
- The low NOx levels were achieved through careful, significant calibration changes and a CSSR (cold start spark retard) approach.

ROUSH CLEANTECH

STUDENT TRANSPORTATION

ROUSH CLEANTECH

Propane School Bus Deployments



ROUSH CLEANTECH

A Growing Trend

OVER
10,000
SCHOOL
BUSES

Ford QVM QUALIFIED VEHICLE MODIFIER

OVER
720
SCHOOL
DISTRICTS

ROUSH CLEANTECH

FOOD & BEVERAGE


Ready Refresh
JUST CLICK AND QUENCH
BY Nestlé
ReadyRefresh.com
YOU choose WE deliver!
CLEAN BURNING PROPANE AUTOGAS


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

ROUSH CLEANTECH

PUBLIC TRANSIT


Metropolitan Transit System
3102
MTS


PARATRANSIT
DART
E450

ROUSH CLEANTECH

WHERE ARE WE HEADED?

ROUSH CLEANTECH

Cost Effectiveness

PROPANE

Purchase price: $95,000
NOx reduced: 537 lbs.

Cost per pound of NOx reduced: $177

DIESEL

Purchase price: $90,000
NOx reduced: 331 lbs.

Cost per pound of NOx reduced: $272

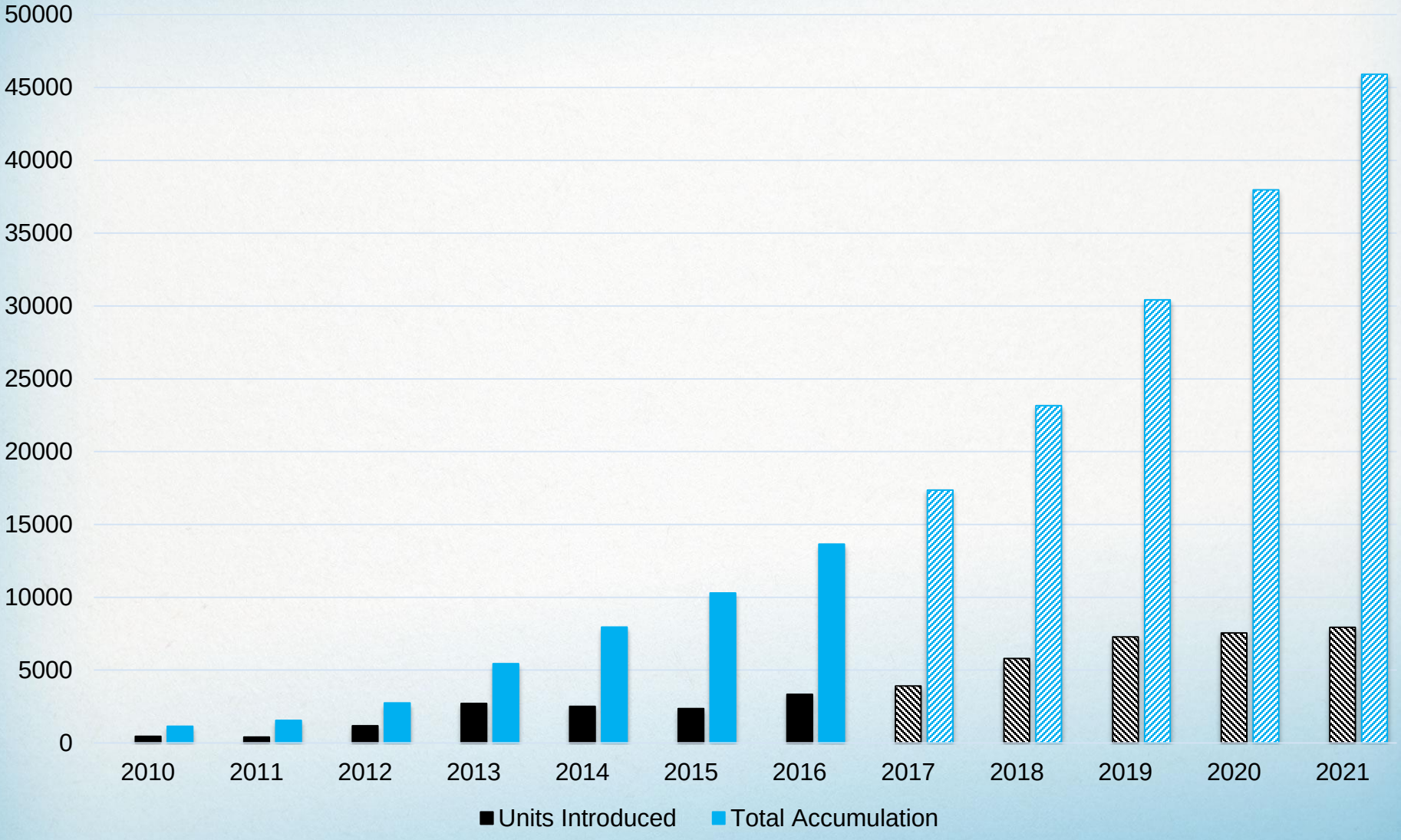
ELECTRIC

Purchase price: $300,000
NOx reduced: 593 lbs.

Cost per pound of NOx reduced: $506

ROUSH CLEANTECH

2021: Units in Operation



THANK YOU

800.59.ROUSH

ROUSHcleantech.com

Todd Mouw
Vice President of Sales
and Marketing

734.466.6522
Todd.Mouw@roush.com

Funding Opportunities for School Districts

Clean Vehicle Solutions Webinar For School Districts

October 31, 2017

Allix Philbrick
Air Quality Planner

North Central Texas Council of Governments

Dallas-Fort Worth CLEAN CITIES

Currently Available

Environmental Protection Agency (EPA)

School Bus Rebate Program

(Deadline November 14)

Texas Commission on Environmental Quality (TCEQ)

Alternative Fueling Facilities Program (AFFP)

(Deadline January 16)

School Bus Rebate Program

Eligible School Buses:

Driven 10k or More Miles Over the Last 12 Months or In Use 3+ Days/Weeks During School Year

Used to Transport 10+ Pre-Primary, Primary or Secondary School Students to School or Homes

Project Type	Eligible Model Year	Funding Level
Replacement	2006 or Older	$15,000 for Class 3 – 5 $20,000 for Class 6 – 8
Retrofits	1994 - 2006	$3,000 - $6,000, Depending on Technology Type

All Old Vehicles/Equipment Must be Scrapped
Current Vehicles/Equipment Must be Diesel

School Bus Rebate Program

Easy 2-Page Application!

"Its free and easy money"

-Terry Penn, Director of Transportation, Rockwall ISD

Replaced 10 School Buses Through
2015 School Bus Rebate Program

Fleets with <100 Schools Buses May
Submit One Application Listing Up To 10 Buses

Fleets With >100 School Buses May
Submit Two Applications Listing up to 10 Buses Each

Applications for Award will be Selected at Random

Deadline: November 14, 2017

To Apply: www.epa.gov/cleandiesel/clean-diesel-rebates

Alternative Fueling Facilities Program

Part of Texas Emissions Reduction Plan (TERP)

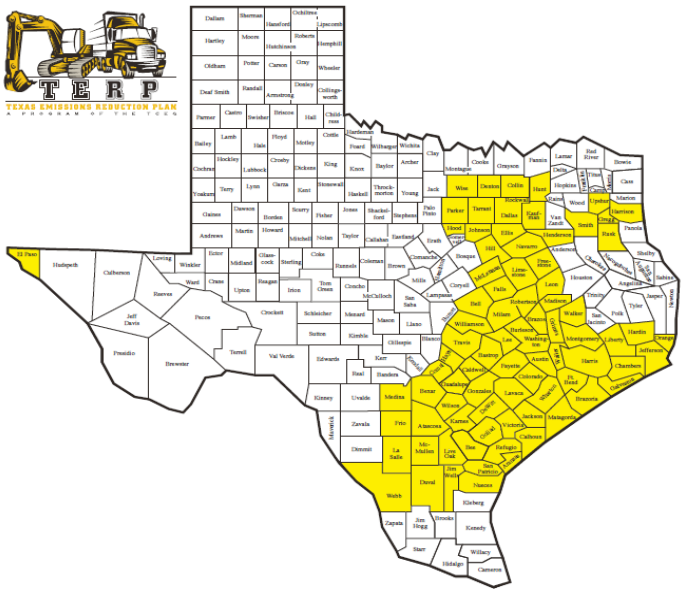
Eligible Activities	Funding Threshold
Install Alternative Fuel Infrastructure In The Clean Transportation Zone	Up To 50% Of Project Cost, Limited To A Maximum Of $600,000

Public Access Preferred but Not Required

Eligible Fuel Types:

- Natural Gas (CNG/LNG)
- Biodiesel
- Hydrogen
- Methanol
- Propane
- Electric Charging

Clean Transportation Zone



Alternative Fueling Facilities Program

Deadline to Apply: January 16, 2018

NCTCOG Electric Vehicle Infrastructure Workshop

November 2, 1:00pm – 3:30pm
616 Six Flags Drive, Arlington TX 76011
Details & RSVP: www.dfwcleancities.org/evnt

TCEQ Alternative Fueling Facilities Program Workshop

El Paso: November 1
Tyler: November 8
Arlington: November 9
Laredo: November 14
Corpus Christi: November 15
San Antonio: November 20
Austin: November 21
Houston: November 28

For more Information on Workshops and To Apply:
www.terpgrants.org

Coming Soon

North Central Texas Council of Governments (NCTCOG)

2017 Clean Diesel Call for Projects (CFP)

(December 2017)

Texas Commission on Environmental Quality

Texas Clean School Bus Program

(Expected Fall 2018)

Volkswagen Settlement Funds

(Anticipated 2018)

2017 Clean Diesel CFP

Eligible Entities:

- Public Fleets
- Private Companies who Contract with Local Governments

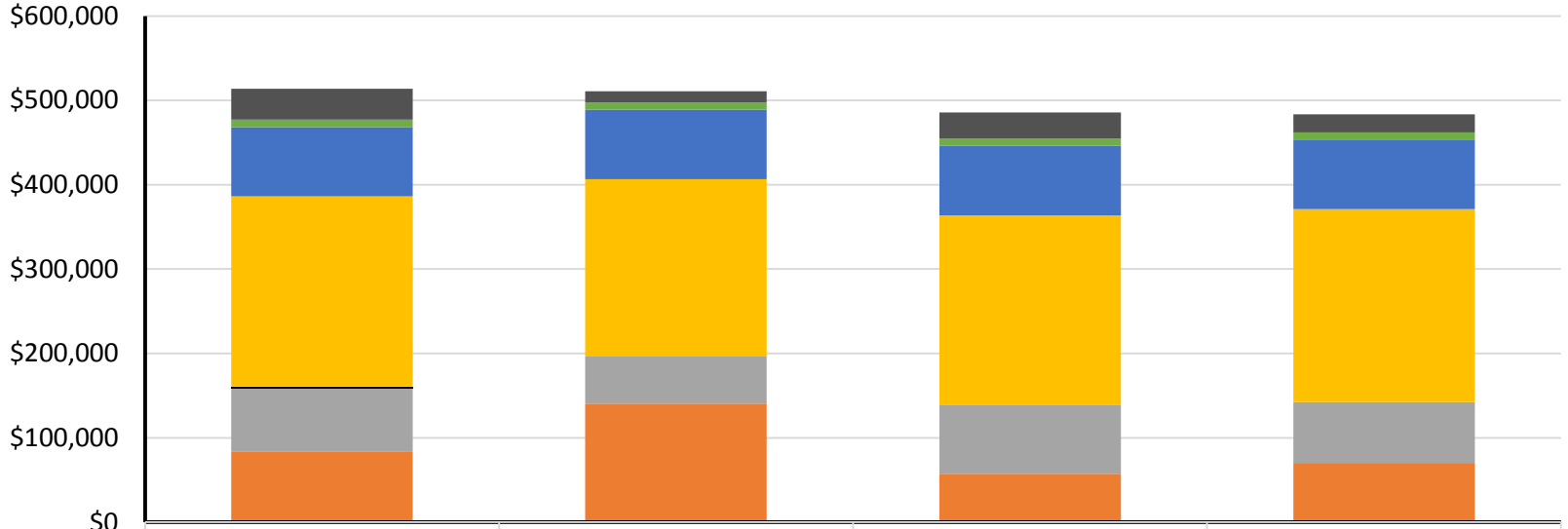
Eligible Activities	Funding Threshold
Replace On-Road Diesel Trucks* 16,000 GVWR and Up; Model Year 1995-2006; (Also Model Year 2007-2009 if Replacing with Electric)	45% Cost if New is Electric 35% Cost if New is Powered by Engine Certified to CARB Optional Low-NO_X Standards (Both Natural Gas and Propane Engines Currently Available)
Replace Non-Road Diesel Equipment* Must Operate >500 Hours/Year; Eligible Model Years Vary	25% Cost for All Others

**All Old Vehicles/Equipment Must be Scrapped*
**Current Vehicles/Equipment Must be Diesel*
CARB = California Air Resources Board
GVWR = Gross Vehicle Weight Rating

North Central Texas Council of Governments

2017 Clean Diesel CFP

Total Cost of Ownership for School Buses by Fuel Type with NCTCOG 2017 Clean Diesel Grant



	Diesel	EV	LPG	CNG
Externalities	$36,844	$13,293	$31,113	$21,281
License and Registration	$8,672	$8,672	$8,672	$8,672
Insurance	$82,331	$82,331	$82,331	$82,331
Maintenance and Repair	$225,192	$210,258	$225,192	$228,806
Diesel Exhaust Fluid	$1,952	$0	$0	$0
Fuel	$74,806	$55,745	$81,179	$72,192
Depreciation	$84,154	$140,663	$57,334	$70,205
Financing	$0	$0	$0	$0

Data from Argonne National Laboratory AFEET Tool:
https://www.anl.gov/

Texas Clean School Bus Program

Part of TERP

Program Changes Made in 2017 Legislative Session

Project Type	Eligible Model Year	Funding Level
Replacement	2006 or Older	Based On Project Submitted
Diesel Oxidation Catalysts	1993 or Older	
Diesel Particulate Filters	1994 - 1998	

Other Project Types:

- Technologies that Bring Significant Emission Reductions
- Qualifying Fuel
- Equipment that Reduce Crankcase Emissions

All Old Vehicles/Equipment Must be Scrapped
Current Vehicles/Equipment Must be Diesel

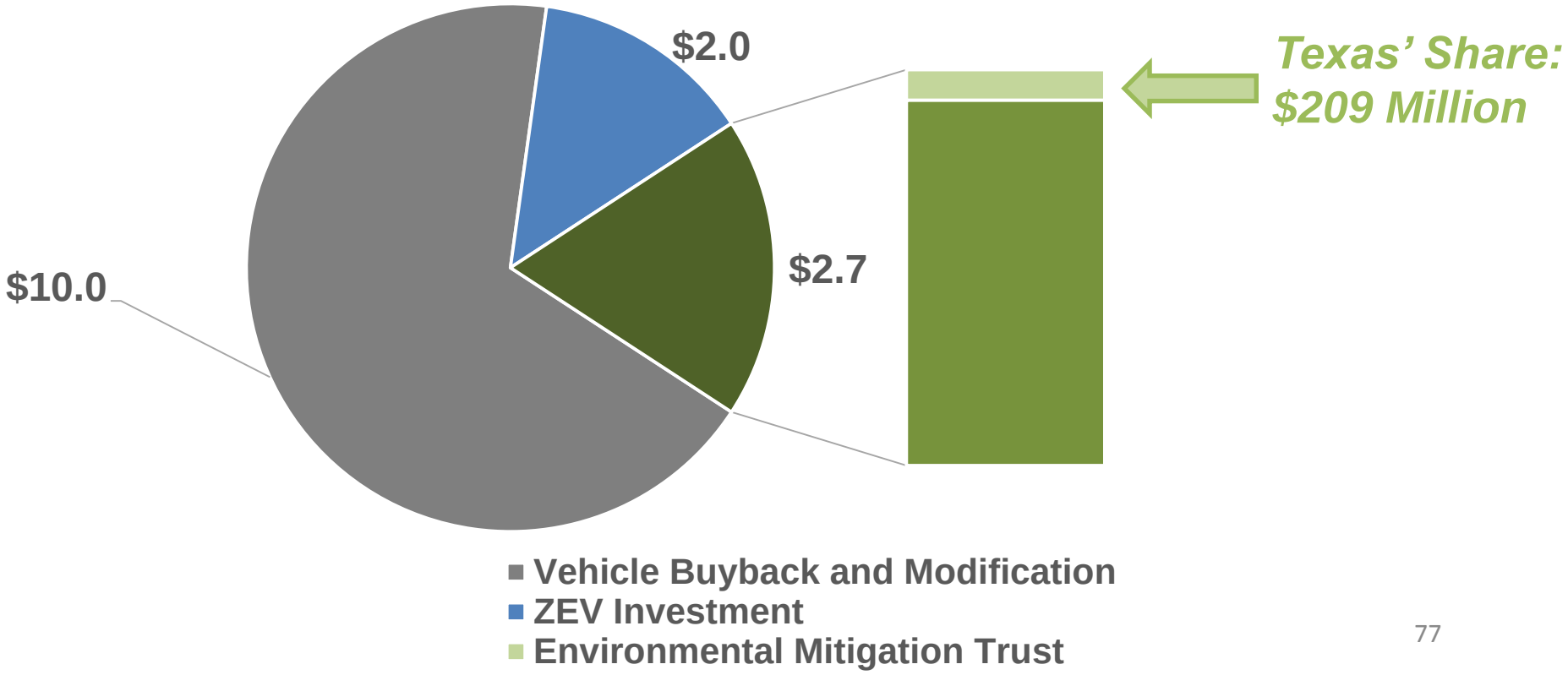
Volkswagen Settlement

Total Settlement To Date: $14.7 Billion

Zero Emission Vehicle (ZEV) Investment - Managed by Electrify America

Environmental Mitigation Trust (EMT) - Distributed To States

Settlement Breakdown ($ in Billions)



Volkswagen Settlement – School Buses

Pending State Action to File as Beneficiary of Environmental Mitigation Trust (Early December)

Charging Infrastructure and Installation Included in Funding

Eligible Activities	Eligible Activities	Funding Threshold
Class 4-8 School/Shuttle/Transit Buses	Replace or Repower Existing Diesel Buses	40% Repower 25% Replacement 75% For All-Electric 100% If Government Owned

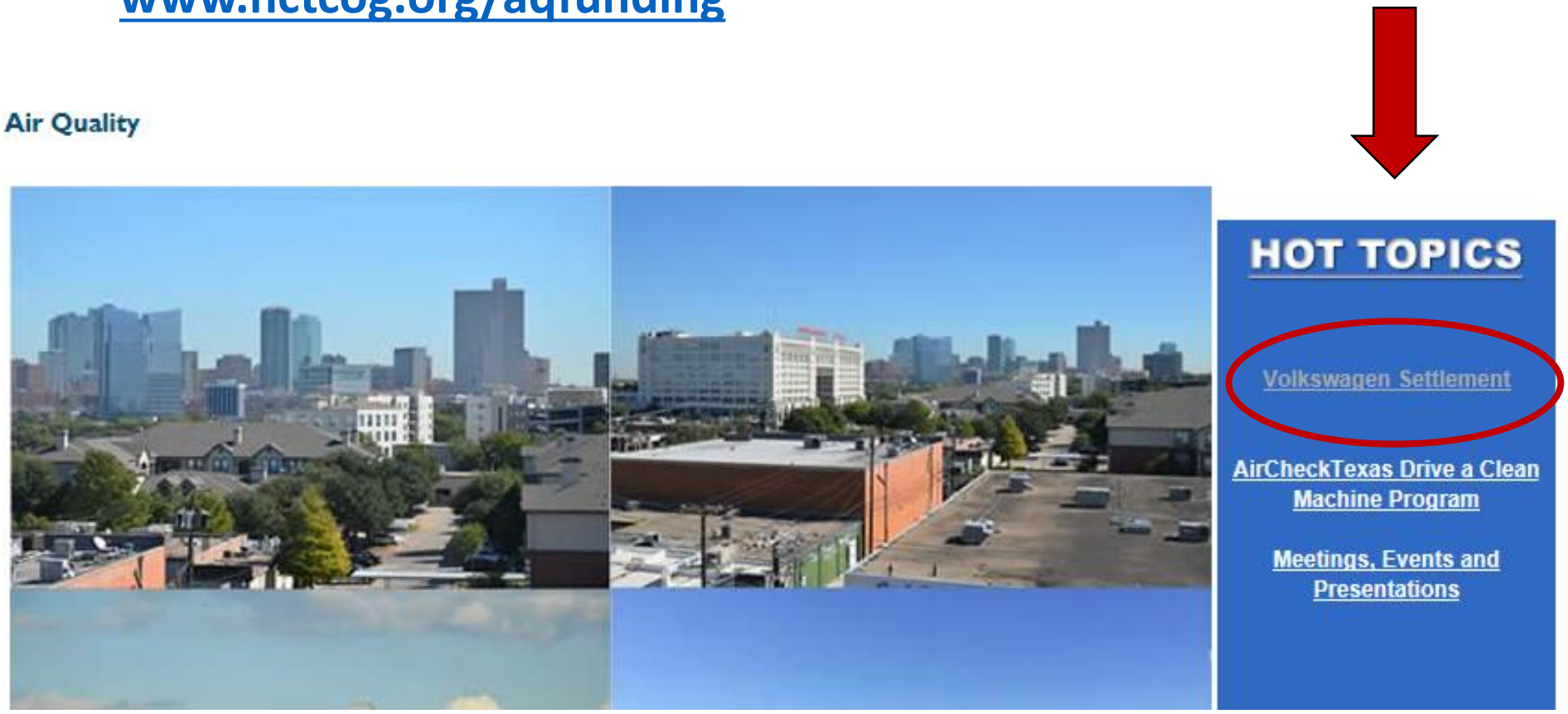
For More Information: www.nctcog.org/trans/air/VWsettlement/

All Old Vehicles/Equipment Must be Scrapped
Current Vehicles/Equipment Must be Diesel

Have A Project Idea? Let Us Know!

NCTCOG Identifying Demand for Projects in DFW

www.nctcog.org/aqfunding



On Volkswagen Page:
"NCTCOG Survey: Fleet Project Wish List"

Sign Up for Email Updates!

Go to: www.nctcog.org/aqfunding

North Central Texas Council of Governments

Dallas-Fort Worth CLEAN CITIES

For More Information

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LClark@nctcog.org

www.nctcog.org/AQfunding

North Central Texas Council of Governments

Dallas-Fort Worth CLEAN CITIES