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Electrifying TERP

How Refocusing Texas' Successful Emission Reduction Program Can Clean the Air, Protect the Climate and Spark Job Creation

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About EDF

Environmental Defense Fund (edf.org), a leading international nonprofit organization, creates transformational solutions to the most serious environmental problems. EDF links science, economics, law, and innovative private-sector partnerships. With offices in the United States, China, Mexico, United Kingdom and Indonesia, EDF's 750 scientists, economists, attorneys – and our partners and allies – work in 26 countries to turn our solutions into action.

EDF has worked in Texas for more than 30 years and on transportation and emission issues since its founding. We are committed to finding solutions that reduce emissions, strengthen the economy, and protect the health of every Texan.

The principal authors of this report were John Hall, James Fine and Sarah Ryan. EDF used data on vehicle registrations and reports from the U.S. Department of Transportation, Texas Department of Transportation and the Texas Transportation Institute at Texas A&M University to develop estimates of bus and truck populations in Texas. To compare the emissions and ownership costs of diesel, compressed natural gas (CNG), and battery-electric vehicles (BEV), we used publicly available information and two open-source computer models:

GREET: a fuel and vehicle lifecycle and in-use operating emissions model that compares diesel, CNG and BEV emissions as a function of model year and usage intensity. This is a peer-reviewed, publicly available, transparent Excel-based model developed by Argonne National Laboratory.

EDF-TCO: a free, transparent Excel-based calculator developed by EDF to compare total cost of ownership and ownership cost components for diesel, CNG and BEV for a variety of MHDV types and duty cycles.

We also reviewed TERP program reports to understand the history, emissions benefits and cost-effectiveness expectations.

Detailed research notes are available upon request from the authors. Please contact John Hall at jhall@edf.org.

Transportation, Emissions, and TERP

Transportation in Texas is tricky.

Texans love our cars — and especially our trucks. We drive more than people in other states, and many of us like it that way. For some of us, it isn't a choice. We're spread out and don't have the same public transportation options as other states.

This thrill of the road and Texas independence has consequences, especially in areas that fight what seems like a never-ending battle against local air pollution and the health and economic consequences it causes.

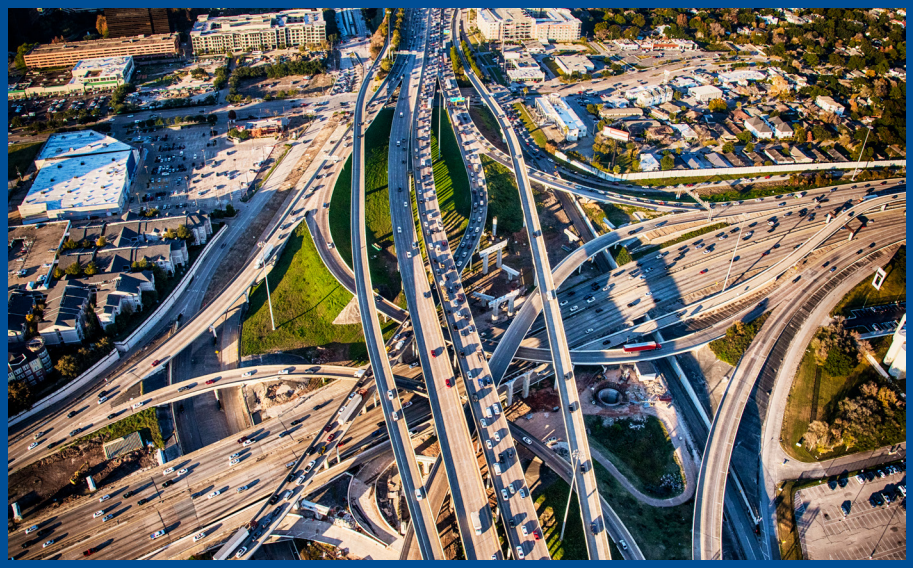
Administered by the Texas Commission on Environmental Quality, the Texas Emissions Reduction Plan (TERP) provides financial incentives to reduce emissions from polluting vehicles and equipment. The bulk of TERP funding has been dedicated to quickening the replacement of larger diesel vehicles – medium- and heavy-duty vehicles (MHDVs). Since 2001, more than 35,000 TERP projects totaling over $1.3 billion in grants have reduced more than 183,000 tons of nitrogen oxides (NOx), a key local pollutant that causes smog[1].

EDF's analysis suggests TERP could be even more powerful.

First, TERP can focus grants on replacing diesel MHDVs with electric models. This would maximize the emission-reduction power of TERP grants and spark a new manufacturing boom in the Lone Star State. And it could do so within its existing budget.

Second, in addition to the annual funding TERP receives through vehicle taxes and fees, the program maintains a $1.992 billion balance of surplus funds. Legislation passed in 2019 (H.B. 3745) requires those funds be used for their stated purpose – reducing emissions in areas where air quality does not meet health-based standards set in the federal Clean Air Act. These areas include the Houston-Gavleston, Dallas-Ft. Worth, San Antonio and El Paso metropolitan areas[2]. Deploying those funds over the next decade to accelerate electric-for-diesel MHDV replacements is a timely next step to maximize the program's emission reduction potential.

Texas Transportation by the Numbers



- Texans drive nearly 10,000 miles per year — 19% more than in 1981 — and use 17% more fuel to get where they're going compared to the national average.[3]
- Texans also rely on bus transit. In 2017, the Texas Department of Transportation reported over 280 million unlinked passenger trips.[4]
- Texas is home to 9 of the country's "worst traffic" cities, calculated by the number of hours each person is delayed in traffic. Houston (#9 nationally) topped Texas cities at 75 hours. Laredo ranked 93 nationally at 32 hours per year.[5]
- Traffic costs money in lost time and productivity. According to the Texas A&M Transportation Institute, the "congestion cost" in Houston is $1,400 per person per year, $1,300 in Austin and $1,200 in Dallas.[6]
- Across the state, Texans lose more than $13 billion a year sitting in traffic.[7]
- More traffic also means more pollution. Even though Texas has 10 million fewer residents than California, it emits more transportation pollution.[8] And though other sectors — most notably, electricity — have reduced emissions of NOx, SO2 and carbon dioxide, transportation emissions in Texas continue to increase, despite advances in fuel efficiency.[9]

Medium- and Heavy-duty Trucks: Texas Workhorses and a Huge Opportunity

The U.S. Department of Transportation (USDOT) reports 13 million tractors, work trucks, transit and school buses, and other medium- and heavy-duty vehicles (MHDV) that move people and goods around Texas and power our economy. The Texas Department of Transportation reviewed registration information to estimate 817,000 medium- and heavy-duty trucks with gross vehicle weight rating (GVWR) above 8,500 lbs. With 272,000 Texas truck tractors reported by USDOT, that leaves approximately 545,000 Class 2b-Class 8 vehicles that we group together as "work trucks".[10]

Because 99% of MHDVs in Texas run on diesel, they produce a disproportionately higher amount of pollution. MHDVs make up roughly 4% of all vehicles in Texas, but they produce 90% of transportation-related NOx emissions from diesel sources.

As Texas' economy continues to grow, so too will this sector of vehicles. This is why TERP has focused heavily on replacing diesel MHDVs with cleaner alternatives. Appropriately, TERP has directed grants for vehicles used in Texas cities that struggle with ongoing air quality challenges and where large populations of residents live near highways and MHDV destinations, such as distribution warehouses, where emissions from truck idling and overnight hotelling create pollution hot spots.

TERP has been successful in helping bus and truck fleet owners overcome the up-front costs of replacing older diesel-powered vehicles. Because electric vehicles have a lower total cost of ownership than diesel vehicles, EDF's analysis suggests that emphasizing the electrification of MHDV would magnify TERP's past success and could achieve pollution reduction at a lower cost.

Table 1 (following page) illustrates the upfront cost difference between electric and diesel models of various trucks and buses and the annual operating savings for each electric model. Electric models require more up front capital than diesel models, but cost differences for most models, even without TERP grant assistance, can be "paid back" via annual operating savings over the life of the vehicle. TERP assistance would make electrification an even more attractive financial decision.

Table 1 Up-front, Operational and Lifetime Ownership Costs of Diesel Vs Battery Electric (BEV)Bus and Truck Models

Vehicle Type (Class)	2018 Texas Population*	Lifetime Ownership Cost		BEV Upfront Cost Gap (BEV Upfront - Diesel Upfront)	BEV Annual Operational Savings
		Battery Electric Vehicle (BEV)	Diesel Vehicle		
Combination Long-Haul Truck (8)	272,000	$893,000	$1,492,000	$195,000	$50,000
Cargo Van (6)	545,000*	$193,000	$158,000	$80,000	$4,000
Box Truck (4)	545,000*	$304,000	$240,000	$141,000	$7,000
Combination Short-Haul Truck (8)	545,000*	$538,000	$658,000	$173,000	$19,000
Transit Bus (7)	18,000	$1,040,000	$1,040,000	$310,000	$36,000
School Bus (6)	34,000	$453,000	$326,000	$239,000	$8,000
Refuse Truck (8)	16,000	$1,635,000	$1,438,000	$390,000	$20,000

* Work trucks include cargo vans, box trucks, combination short-haul, and heavy duty pickup trucks that are categorized by GVWR.

- **BEV Lifetime Ownership Cost**: Based on EDF's Total Cost of Ownership calculator. Lifetime ownership is typically represented as a 12 year period.
- **BEV Upfront Cost Gap (BEV Upfront Diesel Upfront)**: Vehicle purchase price gap difference between BEV and diesel plus on-site electrical infrastructure costs ($50,000). CNG requires more expensive infrastructure investments in the range of $600,000 per site.
- **BEV Operational Savings**: Operating costs include fuel, repairs and midlife replacements.

Cost is important, but not all fleet owners make vehicle replacement decisions based on the same criteria. For some owners, total lifetime cost is critical. For others, up front cost matters most. Further, fleet owners must consider the age of their exiting fleet and whether replacing it is economically feasible. This is the reason TERP funding, coupled with low cost innovative financing solutions, can help drive vehicle electrification and help Texas realize the clean air and economic benefits they provide. (For more on other electrification financing solutions, see EDF's Financing the Transition report at https://bit.ly/EDFevfleets).

The Electric MHDV Boom is Upon Us

The electric transformation that has been embraced by every major passenger vehicle manufacturer is gaining momentum in Texas and the international MHDV sector. Every major truck and bus manufacturer is developing at least one all-electric model or is part of an industry collaboration to bring zero-emission vehicles to market. A recent analysis found that at least 125 such models are in production, development or demonstration.[11]

Figure 1 Medium- and Heavy-Duty Vehicle Types and Classes

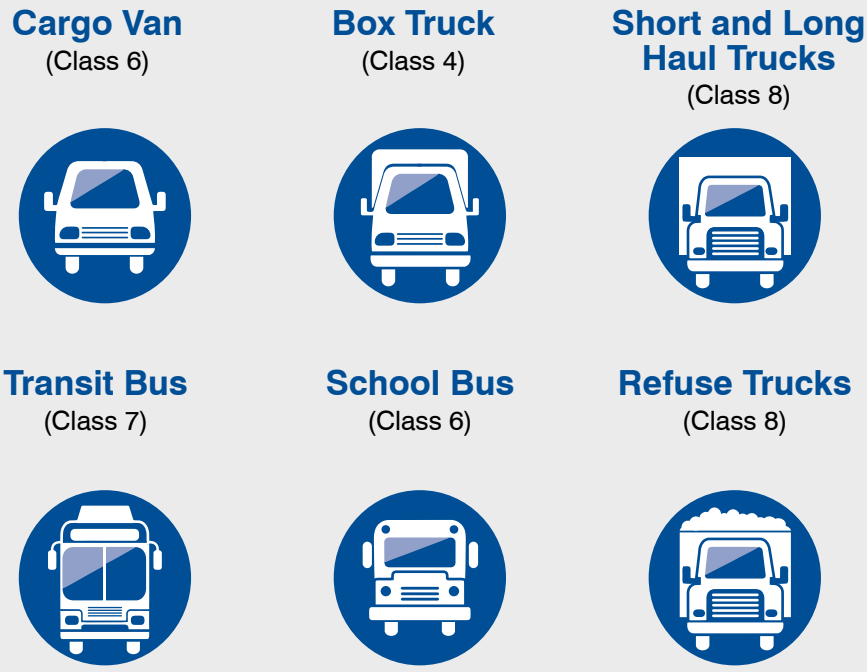


Table 2 Zero-emission Model Availability by Manufacturer and Heavy-duty Vehicle Segment

	Corporate Parent Company	Class 7-8 Tractor Trucks	Class 6-8 Refuse Trucks	Class 4-6 Trucks	Class 2B-3 Trucks and Vans	Coach Buses	School Buses	Transit Buses
Legacy OEMs	Daimler						Proterra	
	Ford			LightningElectric Motiv Phoenix Motors SEA Electric				
	PACCAR	Meritor	Meritor Dana	Dana				
	Navistar						Volkswagen	
	Volvo Group							BAE Systems; Dana TM4
	Isuzu			SEA Electric				
	General Motors			SEA Electric				
	Fiat Chrysler Automobiles							
	Toyota Group							
	Hyundai							
	Autocar							
	Cummins						X	X
	Blue Bird						Cummins	
	NFI Group					Siemens		Siemens Ballard
	Gillig							Cummins
	Van Hool					Proterra		
Zero-emission Vehicle Manufacturers	Proterra			X		X	X	
	BYD	Dana TM4	Dana TM4					
	GreenPower						Siemens	
	Lion Electric							
	Chanje							
	Xos							
	Tesla							
	Nikola							

Green – Manufacturer has at least one zero-emission model currently available for purchase
Yellow – Manufacturer has announced plans and timeframe for zero-emission product commercialization; prototypes or customer testing
Red – No zero-emission products have been announced to date
x – Company provides its zero-emission powertrain to another manufacturer for a vehicle model in that respective segment

Source: Race To Zero Report, October 2020
https://www.edf.org/sites/default/files/documents/Race%20to%20Zero-ICCT_EDF_PQ-FINAL.pdf

In the last five years, commercial EV sales have increased ten-fold, and industry analysts including Bloomberg NEF anticipate significant growth to continue.

- Tesla's new $1 billion Gigafactory in Austin put Texas on the map as an EV hotspot. Scheduled to go online in 2021, the factory will employ 5,000 Texans and assemble passenger vehicles, the company's forthcoming all-electric long-haul truck, and possibly batteries for other Tesla facilities.[12] Walmart Canada has already placed an order for 130 Tesla all-electric long-haul trucks.[13]
- Navistar's $250 million plant in San Antonio will manufacture electric trucks in addition to traditional diesel models.[14]
- Republic Waste's largest market is Texas. It is working with EV manufacturer Nikola to electrify its 2,500 refuse trucks.[15]
- Texas' largest grocery chain, HEB, has committed to transitioning its fleet to electric or hydrogen models as part of the company's broader low-emission strategy.
- IKEA plans to electrify its fleet of yard trucks in Texas in 2021 and across the country by 2026.
- Evolve Houston, the electric vehicle collaborative of the City of Houston, is working to boost EV sales to 30% of all new vehicles and electrify all garbage trucks by 2030. This goal is included in the City of Houston's Climate Action Plan.[16]
- Austin's Capital Metro plans to deploy 200 all-electric buses by 2025. Texas' other major transit agencies have or will launch electric bus pilots in 2021, a prerequisite to full deployment.
- Peterbilt parent company PACCAR is investing $650 million in EV research and development.
- Daimler has announced an $85 billion investment in electrification, including expanding its existing $3 billion investment in electric trucks.[17]
- Longhorn Truck of Texarkana is manufacturing an electric alternative to diesel drayage trucks, a high emitting vehicle that moves freight in and around Texas ports.
- Cummins has invested $500 million in a zero-emissions business unit.[18]
- Amazon has announced a zero emission target, with electric delivery trucks at its core.[19]

Health Impacts

Diesel emissions cause cancer and contribute to other illnesses and early mortality.

The health impacts of diesel emissions are felt disproportionately by Black, Hispanic and other Communities of Color. These Texans are more likely to live near industrial facilities, ports or roadways where diesel emissions are higher and more persistent.

According to the American Lung Association, electrifying transportation in Texas would avoid or prevent:[20]

$6.7 billion in health costs per year

580 premature deaths per year

11,500 asthma attacks per year

47,000 lost work days per year

What about Natural Gas?

Before electric vehicle technology was a suitable substitute for diesel engines, compressed natural gas (CNG) and propane emerged as potential alternatives. Over the last 19 years, the TERP Diesel Emissions Reduction Incentive (DERI) Program, Clean Fleet Program, and Texas Natural Gas Vehicle Grant Program (TNGVGP) have funded more than 12,000 projects, predominantly for diesel hybrid or CNG school buses, transit buses and other heavy-duty vehicle applications.[21] Despite this significant effort, 99% of Texas MHDVs are still powered by diesel.

Our analysis shows that though it may be wise to keep existing CNG vehicles in service today, replacing diesel MDHVs with electric models is more cost effective, would completely eliminate tailpipe and exhaust emissions, and, as a result, have much more powerful pollution reduction potential per dollar invested compared to compressed natural gas options.

Consider the replacement scenario for just one model of MHDV — transit buses. EDF's analysis found that reducing one metric ton of NOx pollution from transit buses costs more than three times as much with a CNG replacement bus ($1,506,000) than with an electric bus ($481,000).[22]

EDF's analysis found that reducing NOx pollution from transit buses costs more than three times as much with a CNG replacement bus than with an electric bus.

Investment in electric vehicle technology has much more economic potential, too. The EV market is expected to grow exponentially in coming decades, while few, if any, vehicle manufacturers are developing new CNG transportation options.

Though the total lifetime ownership costs are lower for electric buses when compared to CNG or diesel, there is still an upfront purchase price gap that TERP grants can help close.

Electrifying TERP: Building on Past Success

Building on past successes, TERP has the potential to ignite the electrification of Texas' MHDV fleet and multiply the program's power to reduce local air pollution and climate emissions.

Based on TERP grant requirements and the current cost of purchasing and maintaining diesel, compressed natural gas, and electric vehicles, EDF found that TERP grants would bring the total cost of ownership of a transit bus to well below any other available model. Further, if electric transit buses took advantage of smart charging utility programs, the total cost of ownership could be lowered even further.

Table 3 Total Cost of Ownership of Replacing an Existing Diesel Transit Bus with One of the New Models

Transit Buses	Total Cost of Ownership
Diesel	$1,040,000
Compressed Natural Gas	$1,540,000
Compressed Natural Gas with TERP Grant	$963,000
Electric Vehicle	$1,040,000
Electric Vehicle with TERP Grant	$644,500
Electric Vehicle with TERP Grant + Smart Charging	$566,000

Total Cost of Ownership = vehicle purchase price + infrastructure costs + annual fuel costs + annual operation and maintenance costs. Electric vehicles have a higher purchase price than diesel models and require some infrastructure investment, but have considerably lower annual fuel and operation and maintenance costs.

For this scenario, the lifetime of the bus was estimated to be 12 years at 35,000 miles per year.

To illustrate the potential a focused electrification strategy could have in just one year, EDF calculated how $225 million in TERP grants (approximately 95% of its current annual program budget) would impact costs and emission reductions if used to replace only one type of vehicle. Table 4 illustrates such an investment for transit buses, combination long-haul trucks, and work trucks.

Table 4 TERP Spending Scenarios

If TERP Invested $225 Million per Year to Spur the Electric Replacement of...	Transit Buses Only	Combination Long-Haul Trucks Only	Work Trucks* Only
It Could Award Grants for...	1875 Replacements	2,250 Replacements	3,750 Replacements
Which Would Reduce the Upfront Cost of Each Electric MHDV by ...	$120,000	$100,000	$60,000
Which Would Shorten the Upfront Cost Difference Payback to This Many Years	5 Years	2 Years	5 Years
Which Would Result in Huge Emission Reductions per Year			
...Greenhouse Gas Emission Reductions per Year of Lifecycle Emissions	1 Million Tons	6.6 Million Tons	1.1 Million Tons
...NOX Emission Reductions per Year of Tailpipe Emissions	477 Tons	3,045 Tons	485 Tons
...VOC Emission Reductions per Year of Tailpipe Emissions	38 Tons	240 Tons	38 Tons
...PM10 Emission Reductions per Year of Tailpipe Emissions and Tire and Brake Wear	29 Tons	186 Tons	30 Tons
...PM2.5 Emission Reductions per Year of Tailpipe Emissions and Tire and Brake Wear	14 Tons	88 Tons	14 Tons

*Work trucks include cargo vans, box trucks, combination short-haul, and heavy duty pickup trucks that are categorized by GVWR.

For illustrative purposes, EDF calculated TERP grants equal to half of the up front cost gap between purchasing an electric model of each truck or bus and a new diesel model.

TERP's impact potential extends far beyond its annual budget. More than 7 times as far, in fact. According to TQEC's Biennial Report to the 87th Texas Legislature,[23] TERP maintains a balance of nearly $2 billion. Applying the $225 million EDF used in our analysis to this existing balance, TERP has more than 7 years of spending power in the bank.

Given the current economic climate, it's clear the 87th Legislative Session will be focused on the budget. We strongly encourage the Legislature to honor H.B. 3745, passed in 2019, which requires that all TERP funds must be expended to reduce emissions from MHDVs vehicles until Texas' air quality challenges are resolved.[24] Substantial additional emission reductions from vehicles must be realized before this public health goal is achieved. Further, economic growth can be halted or significantly reduced and federal highway funds can be withheld if federal clean air and transportation "conformity" planning deadlines are not met.

Electric MHDVs – Cleaner Today, and Even Cleaner Tomorrow

EDF's analysis shows that with today's ERCOT electricity fuel mix, electrifying Texas MHDV fleet would produce much more significant reductions in NOx and greenhouse gas emissions than other replacement technologies.

These reductions could be a lower boundary. Texas' grid is diversifying away from coal and even natural gas and toward zero-emission renewable energy. The emission reducing potential of electric vehicles will increase as this trend continues.[25] In addition, maximizing charging schedules to use more renewable energy and deploying MHDV fleets as power supplies for the grid — so called smart charging — would further multiply the emission reductions of MHDV electrification.

Table 5 (following page) illustrates how replacing existing diesel models of various medium- and heavy-duty trucks and buses would impact emissions. For vehicle type, EDF calculated the potential emission impact of choosing a CNG or BEV (with two different ERCOT generation mixes) instead of a new diesel model. We did not calculate the emissions benefits of taking older trucks off the road. The average age of MHDVs in Texas is 8.4 years. Therefore, our estimate of emissions benefits are conservative and real world benefits are likely to be higher.[26]

Although BEVs have lower emissions than CNG or diesel vehicles, the comparison results in the table show some surprising results. When a diesel vehicle is displaced by a battery electric vehicle charged with ERCOT's current generation fuel mix, or a battery electric vehicle charged with 100% clean energy, emissions decline across the board with the exception of PM emissions from coal-based electricity generation. Negative values in Table 5 represent an increase in emissions; CNG vehicles increase emissions of some pollutants compared to diesel vehicles. Similarly, BEV vehicles still produce PM emissions from tire and brake wear, but at lower rates than diesel or CNG options, principally because BEVs have regenerative braking that creates less brake pad friction.

Table 5 Texas Tailpipes: Electric Vehicles Eliminate On-road Tailpipe Emissions

Vehicle Type		Greenhouse Gases (tons)			NOx (kg)			VOCs (kg)			PM 10 (kg)			PM 2.5 (kg)		
		Life	Per Year	Per Day	Life	Per Year	Per Day	Life	Per Year	Per Day	Life	Per Year	Per Day	Life	Per Year	Per Day
Transit Bus	CNG	-33	-3	-0.01	184	15.3	0.04	-66	-5	-0.02	14.2	1.2	0.003	11.8	1.0	0.003
	BEV ERCOT	768	64	0.18	570	47.5	0.13	89	7	0.02	2.8	0.2	0.001	15.6	1.3	0.004
	BEV 100% Clean	1,266	105	0.29	822	68.5	0.19	144	12	0.03	30.9	2.6	0.007	27.1	2.3	0.006
Long-haul Truck	CNG	228	19	0.05	2,235	186	0.51	-178	-15	-0.04	45.8	3.8	0.010	38.2	3.2	0.009
	BEV ERCOT	1,854	154	0.42	3,093	258	0.71	348	29	0.08	18.0	1.5	0.004	72.9	6.1	0.017
	BEV 100% Clean	3,965	330	0.91	4,161	347	0.95	583	49	0.13	137.0	11.4	0.031	122.0	10.2	0.028
Short-haul Truck	CNG	76	6	0.02	745	62.1	0.17	-59	-5	-0.01	15.3	1.3	0.003	12.7	1.1	0.003
	BEV ERCOT	618	51	0.14	1,031	85.9	0.24	116	10	0.03	6.0	0.5	0.001	24.3	2.0	0.006
	BEV 100% Clean	1,322	110	0.30	1,387	115.6	0.32	194	16	0.04	45.7	3.8	0.010	40.7	3.4	0.009
Box Truck	CNG	-5	0	0.00	111	9.2	0.03	-19	-2	0.00	4.1	0.3	0.001	3.4	0.3	0.001
	BEV ERCOT	170	14	0.04	200	16.7	0.05	32	3	0.01	-1.4	-0.1	0.000	3.8	0.3	0.001
	BEV 100% Clean	362	30	0.08	297	24.8	0.07	53	4	0.01	9.4	0.8	0.002	8.3	0.7	0.002
School Bus	CNG	-12	-1	0.00	81	6.8	0.02	-15	-1	0.00	3.3	0.3	0.001	2.7	0.2	0.001
	BEV ERCOT	136	11	0.03	152	12.6	0.03	25	2	0.01	-1.3	-0.1	0.000	3.0	0.2	0.001
	BEV 100% Clean	291	24	0.07	230	19.2	0.05	42	3	0.01	7.5	0.6	-0.001	6.6	0.5	0.002
Cargo Van	CNG	-6	-1	0.00	161	13.4	0.04	-15	-1	0.00	3.3	0.3	-0.001	2.8	0.2	0.001
	BEV ERCOT	139	12	0.03	237	19.7	0.05	31	3	0.01	-0.5	0.0	0.000	3.7	0.3	0.001
	BEV 100% Clean	297	25	0.07	317	26.4	0.07	49	4	0.01	8.4	0.7	0.002	7.4	0.6	0.002
Refuse Truck	CNG	-19	-2	0.00	209	17.4	0.05	-32	-3	-0.01	7.0	0.6	0.002	5.8	0.5	0.001
	BEV ERCOT	359	30	0.08	401	33.4	0.09	53	4	0.01	4.0	0.3	0.001	10.5	0.9	0.002
	BEV 100% Clean	620	52	0.14	533	44.4	0.12	82	7	0.02	18.7	1.6	0.004	16.6	1	0.00

End Notes

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[20] "The Road to Clean Air: Benefits of a Nationwide Transition to Electric Vehicles." American Lung Association, American Lung Association, www.lung.org/getmedia/99cc945c-47f2-4ba9-ba59-14c311ca332a/electric-vehicle-report.pdf.

[21] Texas Commission on Environmental Quality, "Diesel Emissions Reduction Incentive (DERI) Program, Project List." 2001 through August 31, 2019, Air Grants Division, Oct. 1, 2019, https://www.tceq.texas.gov/assets/public/implementation/air/terp/leg/Project-List-DERI.pdf

[22] Though these NOx reduction costs may appear high compared to TERP programs' NOx cost-effectiveness results, these values represent the full private cost of investment rather than benefits associated with only the public funding portion.

[23] TCEQ, "Texas Emissions Reduction Plan Biennial Report (2019-2020): Report to the 87th Texas Legislature." Air Grants Division, December 2020, https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/079-20.pdf.

[24] See H.B. 3745. 86(R) HB 3745 - House Committee Report Version - Bill Text, capitol.texas.gov/tlodocs/86R/billtext/html/HB03745H.htm.

[25] Almost 70% of ERCOT energy in 2019 was from combustion of natural gas or coal, processes that emit greenhouse gas and smog-forming pollution. However, there was also a significant amount of curtailed renewable generation capacity that could be relied on to serve BEV demand, and renewable energy is increasing in Texas.

[26] Age distribution data for MHDVs was provided by Texas Transportation Institute at Texas A&M University based on registration information requested from the Texas Department of Motor Vehicles.