EARTHJUSTICE

Building Back Better: Accelerating Electric School Bus Adoption

ELECTRIC SCHOOL BUSES ARE A WIN-WIN FOR CLIMATE AND KIDS – REDUCING POLLUTION AND IMPROVING KIDS' HEALTH

With their Build Back Better agenda, President Biden and Vice President Harris laid out a transformative blueprint to tackle climate change, address environmental justice, and reduce air pollution – all while investing in infrastructure and creating jobs. A key part of this agenda includes electrifying medium and heavy-duty transportation. We looked more closely into the impact of spending $2.5 billion on upgraded school buses. Our analysis shows that the shift to electric school buses has enormous benefits, significantly reducing a wide range of pollutants where it matters most.

We urge Congress to pass legislation that advances the electrification technology necessary to improve kids' health, reduce pollution in communities nationwide, and accelerate the market shift to zero-emissions transportation.

Electric vehicles drastically reduce greenhouse gas emissions and eliminate schoolyard air pollution, sparing children's lungs from exposure to nitrogen oxides (NOx), carbon monoxide (CO), fine particulate matter (PM 2.5 and 10), and volatile organic compounds (VOCs), which can lead to ozone and smog. Currently, diesel-spewing buses often idle near schools, drastically increasing local, harmful air pollutants where kids learn and play.

Proponents of fossil fuels often argue that Compressed Natural Gas (CNG) and propane-powered buses are alternatives to diesel, recognizing after decades of evidence that the status quo of diesel buses produce real harm. While CNG and propane (liquified petroleum gas, or LPG) buses have lower NOx emissions than diesel, CNG and LPG engines perform equal to or worse than diesel when it comes to carbon monoxide, particulate matter, and nonmethane hydrocarbons, which can lead to ozone and smog (see table and chart). Looking beyond NOx emissions, the only argument for fossil alternatives to diesel is fuel cost savings as there are very limited pollution benefits. Alternative fuels also need alternative infrastructure and cost more than diesel-powered buses. CNG and LPG-powered buses have logistical and financial hurdles, without the pollution reduction and zero-emissions benefits of electric school buses.

What we found:

We compare the pollution impacts of spending $2.5 billion on diesel, CNG, propane, and electric buses. Our analysis shows that spending the money on upgraded or "clean" diesel buses, CNG, and propane would amount to up to 7.5 billion tons of greenhouse gas emissions, 88 billion pounds of carbon monoxide pollution, and 12.5 million pounds of NOx.

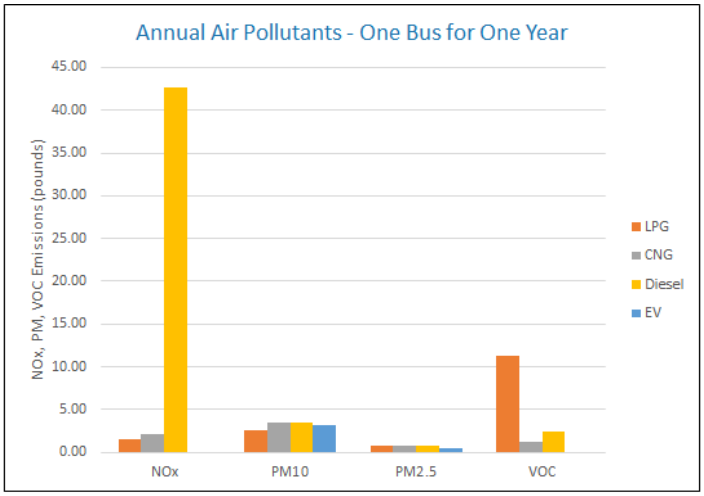
The CEO of Thomas school bus company admits, "All [fossil] engine types have nearly the same emissions footprint." A 2018 study reinforces this: "Propane and CNG school buses do not significantly improve air quality compared to newer models of diesel buses, and actually emit some forms of pollution at higher levels….The primary benefit of propane and CNG school buses is fuel and maintenance cost savings....Propane and CNG buses do not have substantial environmental benefits…[and] are more expensive than their diesel counterparts."

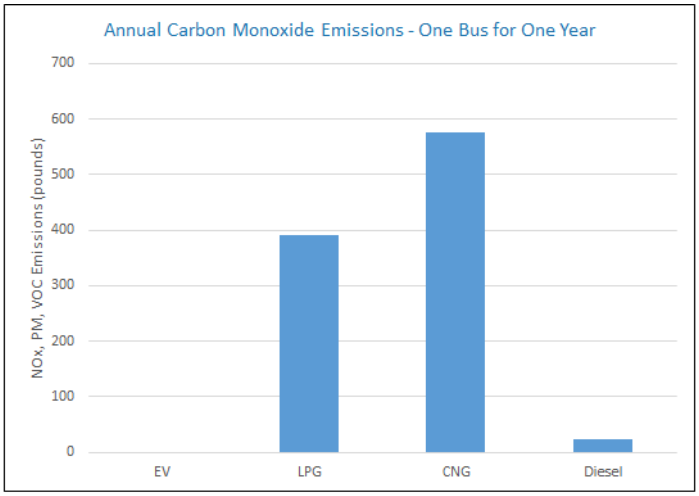
		NITROGEN OXIDES (grams per brake hp per hour)	PARTICULATE MATTER (grams per brake hp per hour)	CARBON MONOXIDE (grams per brake hp per hour)	NON-METHANE HYDROCARBON (grams per brake hp per hour)
	2017 FEDERAL EMISSIONS STANDARDS	0.20	0.01	15.5	0.14
ELECTRIC	2021 PROTERRA PRODRIVE	0.000	0.000	0.000	0.000
DIESEL	2021 CUMMINS B6.7	0.11	0.004	0.03	0.03
DIESEL	2021 DETROIT® DD5™	0.08	0.001	0.5	0.03
CNG	2021 CUMMINS B6.7N	0.01	0.002	1.5	0.01
PROPANE	2021 ROUSH 6.8L	0.01	0.002	5.0	0.04
PROPANE	2021 DRIVEFORCE 8.8L	0.13	0.000	1.9	0.10
PROPANE	2021 PSI 8.8L	0.02	0.000	2.7	0.05
GAS	2020 FORD V10	0.08	0.002	12.9	0.08
GAS	2021 PSI 8.8L	0.04	0.001	3.7	0.08

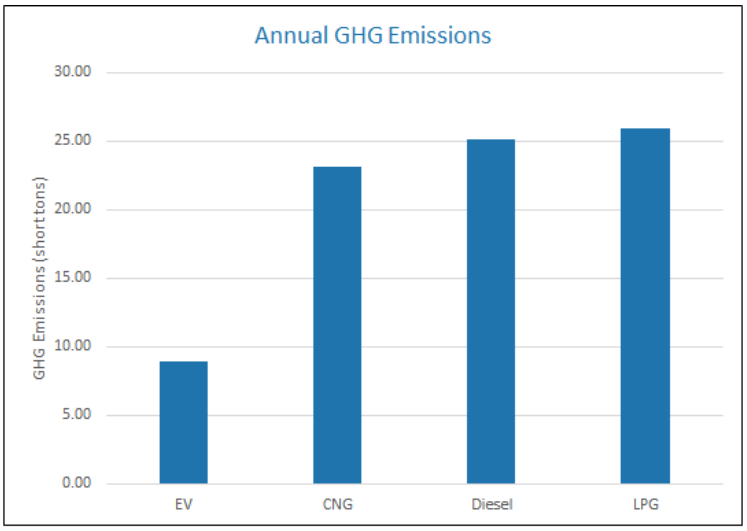
*RESULTS ARE BASED ON FEDERAL TEST PROCEDURE (FTP) CYCLE. 3/21

Figure 1:
Compares tailpipe emissions from different school bus engines. Electric school buses do not have tailpipe emissions. Source.

Below, results from the AFLEET calculator demonstrate the bus-by-bus advantages of electric vehicles. We want to note that PM levels for electric school buses are taken from the bus' lifecycle, and that these PM levels will not impact children directly. The charts below are clear: all-electric wins across the board, and propane, CNG, and newer diesel do not come close. In fact, they do not make much of an improvement at all.







Figures 2-4:
From the AFLEET tool, these figures show the average annual pollution from one bus of each fuel type.

Electric vehicles clearly outperform their fossil-fuel-powered competition. Our independent analysis outlines the long-term pollution impacts of spending $2.5 billion on dirty buses.

Table 1:
How many buses $2.5 billion can buy, by fuel type.

Fuel	Average Cost of 1 Bus	How many buses could you buy with $2.5B?
Diesel	$100,000	25,000
EV	$300,000	8,333
CNG	$130,000	19,231
LPG	$108,000	23,148

Note: While the upfront cost of electric school buses is higher, in addition to the significant emissions savings, electric buses have a lower cost of ownership over their lifetime.

As of 2018, only 40% of school buses ran on "clean diesel," 1% on CNG and LPG each, and less than 1% were electric. Of the 480,000 school buses in the United States, 273,600 still run on old, dirty diesel. $2.5 billion is a great start for electric school buses; however, the need is much greater. It is vital that any federal funding to purchase school buses contribute to meeting the President's climate and environmental justice goals – and further locking us into fossil-fueled buses is inconsistent with these goals.

The data is clear that electric buses are the best solution for reducing pollution and greenhouse gas emissions, and keeping children safe.

With $2.5 billion, how much pollution could you buy for one year?

Table 2:

Using the results from Table 1, this table shows the results of multiplying the number of buses $2.5 billion could purchase for each scenario by the average annual emissions for one bus of each type. See end of document for more information on scenarios. Note that EV PM emissions are lifecycle emissions and do not occur during vehicle use, meaning children are not directly exposed to these emissions.

	Tons/Year	Pounds/Year	Pounds/Year	Pounds/Year	Pounds/Year	Pounds/Year
	GHG/year	CO/year	NOx/year	PM 10/year	PM 2.5/year	VOC/year
25,000 diesel buses	627,250	601,750	1,066,000	87,750	18,250	61,250
22,189 buses (average of Diesel/CNG/LPG characteristics, incl. cost)	548,817	7,332,175	342,530	71,154	15,976	110,133
23,652 buses (70% diesel, 15% CNG, 15% LPG)	589,629	3,830,061	718,981	79,789	17,159	84,697
8,333 EVs	74,500	0	0	26,167	3,333	0

With $2.5 billion, how much pollution could you buy for 12 years (average school bus lifespan)?

Table 3:

Using the results from Table 2, this table shows the results of multiplying Table 2's results by 12, the average lifespan of a school bus. Note that EV PM emissions are lifecycle emissions and do not occur during vehicle use, meaning children are not directly exposed to these emissions.

	Tons	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
	GHG total	CO total	NOx/total	CO total	PM 10 total	PM 2.5 total	VOC total
25,000 Diesel Buses	7,527,000	7,221,000	12,792,000	153,504,000	1,053,000	219,000	735,000
22,189 buses (average of Diesel/CNG/LPG characteristics, incl. cost)	6,585,799	87,986,095	4,110,355	49,324,260	853,846	191,716	1,321,598
23,652 buses (70% diesel, 15% CNG, 15% LPG)	7,075,544	45,960,738	8,627,767	103,533,207	957,474	205,913	1,016,367
8,333 EVs	894,000	0	0	0	314,000	40,000	0

How we did it:

We used data from Argonne National Laboratory's AFLEET tool, which provided the average cost of each type of bus, and average annual greenhouse gas and air pollution emissions of each type of school bus. This data is well-to-wheel data, meaning it considers lifecycle emissions from fuel production through end-use. This means that electric school buses have some emissions, based on the average U.S. power grid mix. **It is critical to note that electric bus emissions do not happen in the schoolyard – the positive impact of avoiding pollution exposure by going electric is even greater than is stated in this analysis.**

The analysis does not make any assumptions about how much of the funding would be used for charging infrastructure, fueling, maintenance, training, or other potential uses for the funding; rather, it is an approximation of potential pollution impacts if all $2.5 billion was used to purchase new vehicles.

The "average" scenario uses a simple average of costs and pollution levels for the three fossil fuel sources. The 70-15-15 scenario imagines that the money was split, spending 70% on updated diesel buses, 15% on CNG buses, and 15% on LPG buses.

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