

Thank you, senators, for hearing my testimony on behalf of House bill 696. My name is Justin Carlson and I am currently an Intern under Mr Fraser-Hidalgo of Maryland district 15. As we know right now, the world is warming, this warming, if it continues to increase past 2 degrees Celsius, will cause damage to the Earth that could be irreversible. Changing the *heavily polluting* Diesel-powered school buses to electric ones will help lower the emissions from Maryland. Not only are electric buses *greener* and *safer* for the planet, but they will also save the state a substantial amount of money in diesel prices and maintenance fees.

In order to research this topic, I looked at the information provided to me by Mr Fraser-Hidalgo, which was given to him by the bus manufacturers. 1 electric bus gets 155 miles for a 220KwH charge. To compare electric buses to diesel buses, I also gave the Diesel buses a range of 155 miles. A diesel bus, in order to go 155 miles, with an average of 8.5 miles per gallon, provided by Thomas buses themselves, a diesel bus needs 18.235 gallons of Diesel. With the cost of diesel at \$5.6, as it is in my neighbourhood, it will cost \$102.12 for a diesel bus to go 155 miles. However, in order to cover 155 miles, an electric bus with a charge of 220 KwH in order to cover 155 miles, costs 22 dollars, as electricity prices are .10 per kWh. This is a price difference of \$80.12. So we have already established that the electric bus already saves you \$80.12 dollars for 155 miles. However, a diesel bus can hold between 80-100 gallons of diesel, which can get you between 680-850 miles, which is between 4 and 6 charges for an electric bus. This costs you between \$448-560 to fill the tank with diesel. But for an electric bus, this only costs 88-132 dollars. Saving 360-428 dollars even though you are recharging the electric bus multiple times.

Based on my math, you would have to recharge an electric bus every 3 days. I found this by recording the distance of my bus's total route, which is 8 miles. I then multiplied this by 6 since most buses do a route for elementary school, middle school and high school, for the morning and afternoon. This comes out to 48 miles a day for one bus. So you would need to recharge or refuel the bus every 3 days if it has a range of 155 miles. Over one full school year of 180 days, or 60 refuels you save \$4,483.93 on one bus. For the full 15 year lifespan of one of these buses, you save \$67,259. This doesn't include buses working in the summer or doing school field trips. Which raises the amount of savings even more.

Along with being more cost-effective, electric buses are more environmentally friendly. If the bus has to be powered by non-renewable energy sources, it is much less polluting compared to diesel. Diesel produces about 22.4 lb of co2 per gallon, while the production of one Kwh created .85 lb of co2 according to information provided by the EPA. For 155 miles, a diesel bus will produce 408.46 pounds of co2, while an electric bus will produce a near 187 pounds, a difference of 221.01 pounds of co2. For a full school year, that is a difference of 13,287.6 pounds of co2. And the best thing is if these electric buses are powered by 100% renewable energy sources, then the electric bus will produce ZERO, ZERO pounds of co2. Which is a difference of 24,507.6 pounds of co2 a year. The 15 year lifetime of one of these electric buses, will save over 294,091.2 pounds of co2 from being released into the air.

Another cost associated with diesel buses is the maintenance cost(s). Based on the resources I found they say that it costs on average \$1.53 per mile for maintenance of a diesel bus. Electric buses still require maintenance, but they are *significantly* cheaper, at \$.55 per mile. A cost difference of \$.98 cents, which can build up over time. For a diesel bus, it costs \$14,229 a year on maintenance. While an electric bus only costs \$5,115. A difference of over \$9,114. Over its 15-year life span that is a saving of over \$136,710. This price doesn't even include engine breakdowns, crashes, and other unknown expenses. This just covers the cost of things like tire replacement, engine/motor maintenance, and battery replacement.

One of the things people are wary of at first is the high upfront cost of an electric bus. This cost is \$355,000 USD according to the information provided to me by Mr. Fraser-Hidalgo. This costs more than the standard diesel bus at around \$180-200,000. However, according to the math I did, not only will you pay the bus off within its 15-year lifespan but it will also save upwards of \$48,969 USD but could also save even more if gas prices continue to rise. If you replace all 7,300 buses in Maryland, you would save over 357,473,700 dollars over a 15 year period. I believe that this is the best option for Maryland to help us work to net-zero carbon emissions and help save Maryland schools' system money.

Feel free to email me with any questions you have about my testimony!
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