MARC KORMAN
Legislative District 16
Montgomery County

Appropriations Committee
Subcommittees
Capital Budget
Chair, Transportation and the Environment
Oversight Committee on Personnel

THE MARYLAND HOUSE OF DELEGATES
ANNAPOLIS, MARYLAND 21401

The Maryland House of Delegates
6 Bladen Street, Room 210
Annapolis, Maryland 21401
410-841-3649 · 301-858-3649
800-492-7122 *Ext.* 3649
Marc.Korman@house.state.md.us

Zero-Emission Bus Transition Act Fact Sheet

Overview

The Maryland Transit Administration (MTA) is a part of the Maryland Department of Transportation (MDOT). Among its other functions, MTA runs the local bus service in Baltimore City (CityLink and LocalLink) and 36 commuter bus routes around the state. MTA's transit bus fleet consists of more approximately 760 buses.

The Zero-Emission Bus Transition Act will transition MTA's fleet to 100% zero-emission buses over time. The legislation passed the House of Delegates with bi-partisan support during the 2020 session. Starting in FY 2022, the bill prohibits MTA from entering into new contracts to procure buses that are not zero-emission. The bill will not disrupt any existing multi-year bus procurement contracts that MTA is currently engaged in. The process required by the bill will allow MTA to transition its fleet without disruption to existing service and gives the agency time to implement the infrastructure necessary to sustain a fleet that consists entirely of zero-emission buses which are primarily powered by electricity.

To ensure that MTA remains on schedule to implement the transition, the bill mandates that starting in 2021, MTA must submit an annual report to the legislature that must include the following:

- An evaluation of the charging infrastructure needed for MTA to maintain an all-zero emission fleet;
- A plan for transitioning any workers adversely effected by the transition from diesel to zero-emission buses to similar roles commensurate with seniority, pay and benefits within MDOT MTA;
- An estimate of the amount of carbon dioxide emissions, measured in pounds, that will be saved due to the use of zero-emission buses each year until the transit bus fleet is converted to zero-emission;
- A financial analysis of the projected cost of implementing and maintaining charging infrastructure; and
- A comparison of the projected cost of the zero-emission bus fleet to the cost of continuing the legacy fleet.

MTA's Current Fleet and Bus Replacement System

MTA purchases new buses on a yearly basis, with a goal to replace any bus that has been in service over 12 years. Given the size of the MTA fleet, approximately 60 buses are targeted for replacement each year as part of the Consolidated Transportation Program (CTP). The current draft CTP provides the following funding for MTA bus replacement:

POTENTIAL FUNDING SOURCE: [X] SPECIAL [X] FEDERAL [ ] GENERAL [ ] OTHER

PHASE	TOTAL ESTIMATED COST ($000)	EXPENDED THRU CLOSE YEAR	PREVIOUS YEAR 2020	CURRENT YEAR 2021	BUDGET YEAR 2022	PLANNING FOR PLANNING PURPOSES ONLY ...2023...	...2024...	...2025...	...2026...	SIX YEAR TOTAL	BALANCE TO COMPLETE
Planning	0	0	0	0	0	0	0	0	0	0	0
Engineering	341	341	0	0	0	0	0	0	0	0	0
Right-of-way	0	0	0	0	0	0	0	0	0	0	0
Utility	0	0	0	0	0	0	0	0	0	0	0
Construction	491,740	183,539	38,672	64,854	33,044	32,561	43,827	87,915	46,000	308,201	0
Total	492,081	183,880	38,672	64,854	33,044	32,561	43,827	87,915	46,000	308,201	0
Federal-Aid	301,655	146,913	31,376	54,828	28,088	27,677	26,980	0	17,169	154,742	0
Special	190,426	36,967	7,296	10,026	4,957	4,884	16,846	87,915	28,831	153,459	0
Other										0	

1447

MTA has just completed a multi-year procurement of hybrid diesel electric buses and is embarking on a new contract to procure 350 "clean diesel" buses over five years. As of October 2020, MTA's bus fleet consists of 402 hybrid diesel electric buses, and 358 "clean diesel" buses.

While the implementation of hybrid electric buses are a promising start, Maryland needs to do more in order to meet its emissions reductions goals. The Hogan Administration has indicated that they would like to make a significant investment in transit buses powered solely by electricity in order to meet the state's emissions goals. The Administration's draft of Greenhouse Gas Reduction Act plan includes an assumption that the MTA bus fleet will be "50 percent EV buses by 2030." (Pg. 81 of draft plan). The Zero-Emission Bus Transition Act will put the MTA fleet ahead of schedule to meet the Administration's goal.

Trend of Electrification Efforts

Several localities in Maryland have already started the process of transitioning their buses to zero-emission electric buses. For example, both Howard and Frederick County began procuring zero-emission electric buses in 2017. Howard County currently operates three zero-emission electric buses and Frederick County has eight buses. Notably, Frederick County found that each zero-emission electric bus saved more than $50,000 over their diesel counterparts. [1] After Volkswagen was caught cheating on emissions tests in 2016, the German automaker settled to pay $2.7 billion into an environmental mitigation fund to be distributed among the states. Maryland spent its settlement money on electric buses for local transit systems, charging stations, and environmental projects throughout the state.[2]

[1] Marshall, Ryan. "County Looks at Adding More Electric Buses to Fleet." Post, 16 Apr. 2018, https://www.fredericknewspost.com/news/politics_and_government/levels_of_government/county/county-looks-at-adding-more-electric-buses-to-fleet/article_ec0cba88-7bc5-5aef-a514-83ede66266a9.html

[2] Fenston, Jacob. "Maryland To Spend Millions On Electric Cars, Buses and Charging Stations Using Volkswagen Settlement Money." WAMU, WAMU 88.5 - American University Radio, 13 Feb. 2019,

Other states have begun the electrification process as well.[3] Washington state allocated its Volkswagen settlement money to purchase 50 electric buses for the state's local transit agencies and provide them with grants to cover additional costs like charging stations.[4] In 2007, Washington state passed a law that said that local jurisdictions had to switch their vehicle fleets to run solely on electricity or biofuel by June 2018.[5] More than a decade later, Washington has yet to achieve this goal. The lack of success can be partly attributed to the bill's weak language. The legislation stated that the transition to electric buses should be done "to the extent practicable". That wording has appeared to serve as a loophole for local jurisdictions to avoid transitioning their fleets.

While electrification trends in the United States have been slow, China has become the clear leader in electric bus use. According to a 2019 BloombergNEF report, 421,000 of the 425,000 zero-emission electric buses in operation worldwide are in China.[6]

Zero-Emission Electric Bus Manufacturers

There are a variety of manufacturers of zero-emission electric buses, both foreign and domestic. Chinese companies currently dominant the market share, but have recently started selling to American cities. The following is a list of companies that have manufactured electric buses and the transit fleets that utilized them:

- **Proterra**. Located in Burlingame, California. The company produces electric vehicles at a plant in the City of Industry, California and in Greenville, South Carolina. In 2018, the company supplied 14 zero-emission electric buses to Washington D.C and four to Everett County's fleet in Washington State.[7]
- **New Flyer**. Headquartered in Crookston, Minnesota and includes four manufacturing plants across the United States. Supplied 15 buses for New York City in 2019. New Flyer is the American subsidiary of the NFI Group which is headquartered in Winnipeg, Canada.
- **BYD North American**. The company is headquartered in Los Angeles with a manufacturing plant in nearby Lancaster. The company has supplied zero-emission electric buses to several American municipalities, including eight to Frederick County,

---

wamu.org/story/19/02/13/maryland-to-spend-millions-on-electric-cars-buses-and-charging-stations-using-volkswagen-settlement-money/.

[3] Most states do not operate sizeable bus fleets but leave that to the local governments. MTA in Maryland is unusual in that regard.

[4] Wineke, Andrew. "50 Electric Buses Coming to Washington Transit Agencies." June 12 50 Electric Buses Coming to Washington Transit Agencies - Washington State Department of Ecology, ecology.wa.gov/About-us/Get-to-know-us/News/2019/June-12-50-electric-buses-coming-to-Washington-tra.

[5] Deshais , Nicholas. "Eleven Years After Bill, City Fleets in Washington State Are Nowhere Near Abandoning Gas-Powered Vehicles." Government Technology State & Local Articles - e. Republic, June 4, 2018. https://www.govtech.com/fs/Eleven-Years-After-Bill-City-Fleets-in-Washington-State-are-Nowhere-Near-Abandoning-Gas-Powered-Vehicles.html.

[6] Eckhouse, Brian. Bloomberg.com. Bloomberg, May 15, 2019. https://www.bloomberg.com/news/articles/2019-05-15/in-shift-to-electric-bus-it-s-china-ahead-of-u-s-421-000-to-300.

[7] "Proterra Sells Electric Buses to Washington, D.C., Public Transit System." Los Angeles Times, May 11, 2018. https://www.latimes.com/business/autos/la-fi-hy-proterra-dc-20180510-story.html.

three to Howard County, 13 to Indianapolis and 36 to Denver. BYD's Chinese affiliate is headquartered in the city of Shenzhen. The company operates 40,000 zero-emission electric buses worldwide in 300 cities, but the vast majority are in China. With over 16,000 zero-emission electric buses from BYD, Shenzhen became the first city to transition their entire bus fleet to all-electric.[8]

- **Yutong**. Located in Zhengzhou, China, Yutong is the global leader in zero-emission electric bus sales. In addition to large sales in China, Yutong supplied 100 buses to Chile in 2018 and will also supply 100 buses to the Kazakhstan capital city of Nur-Sultan.[9][10]
- **Gillig**. The company's headquarters and manufacturing plant are located in San Francisco and they have supplied electric buses to Seattle's King County Metro.
- **VDL Bus & Coach**. A Dutch company based in Valkenswaard, VDL supplied 100 buses for use in Amsterdam and also sold 21 buses to Copenhagen, Denmark in 2018.[11]

Drawbacks and Solutions

Do environmental factors such as temperature and terrain impact the performance of electric buses?

Yes. Environmental factors have been shown to have some impact zero-emission electric buses, but that does not mean an all-zero emission bus fleet is unsustainable. For example, a Phoenix zero-emission electric bus reached less than two-thirds of its advertised range during a test run because of extreme heat in the summer of 2017.[12]

However, Maryland will be in a much better position than localities like Phoenix that have tested zero-emission electric buses. In the reporting requirements that the bill requires, MTA will have adequate time to study the financial and logistical needs of the charging infrastructure and implement the appropriate plan. This study period will allow MTA to create adequate contingency plans for weather to make sure that the bus fleet is equipped to deal with Maryland's climate. Moreover, Maryland's climate is much more temperate than some southwestern or northeastern locations where this has been an issue.

Do zero-emission electric buses have enough range to serve as mass transit?

---

[8] Eckhouse, Brian. "The U.S. Has a Fleet of 300 Electric Buses. China Has 421,000".

[9] Yutong Bus. Yutong Bus to Deliver 100 Electric Buses to Chile, Becoming the Leading Chinese Bus Supplier in Latin America, November 23, 2018. https://www.prnewswire.com/news-releases/yutong-bus-to-deliver-100-electric-buses-to-chile-becoming-the-leading-chinese-bus-supplier-in-latin-america-300754748.html.

[10] "100 Yutong Electric Buses Are Headed to Kazakhstan's Capital." Sustainable Bus, October 7, 2019. https://www.sustainable-bus.com/electric-bus/100-yutong-electric-bus-are-headed-to-kazakhstans-capital/.

[11] Kane, Mark. "VDL Bus & Coach Sold 500th Electric Bus." InsideEVs, April 24, 2019. https://insideevs.com/news/340580/vdl-bus-amp-coach-sold-500th-electric-bus/.

[12] Groom, Nichola. "U.S. Transit Agencies Cautious on Electric Buses despite Bold Forecasts." Reuters. Thomson Reuters, December 13, 2017. https://www.reuters.com/article/us-transportation-buses-electric-analysi/u-s-transit-agencies-cautious-on-electric-buses-despite-bold-forecasts-idUSKBN1E60GS.

Yes. During a trial study in Albuquerque, BYD buses achieved an average range of 150 miles, topping out at 177 miles.[13] While an average range of 150 miles may not seem like much for a standard vehicle, it is more than capable of meeting the demands for an zero-emission electric bus fleet travelling along a fixed route. With an adequate implementation of charging equipment along the bus routes, the MTA bus fleet in Baltimore City will be able to easily support this range. Furthermore, considering that city driving consists mainly of accelerating and braking, buses powered primarily by electricity will be able to take advantage of technology known as Regenerative Braking System (RBS). RBS converts some of the kinetic energy used in braking into electricity and stores it in the battery to give additional driving range. This technology is used by BYD's electric buses and has been particularly successful with the Shenzhen fleet.[14] Even though commuter bus routes throughout the rest of Maryland are much longer than Baltimore City's, the distance between each stop still falls under the range of 150 miles. This necessitates that each commuter bus station be equipped with recharging equipment.

Are zero-emission electric buses more expensive than diesel?

No, the up-front costs of zero-emission electric buses are higher than their diesel counterparts, but studies have shown that zero-emission electric buses are more cost-efficient in the long-term thanks to their lower operational costs. The average zero-emission electric bus costs about $750,000 up-front, while diesel buses are significantly cheaper, costing around $435,000.[15] However there is ample evidence to suggest that electric buses cost less over the life of the bus. In addition to Frederick County's reported savings of $50,000 per bus, a 2016 analysis from Columbia University on zero-emission electric buses for New York City's transit service found that the 12-year lifetime cost of a zero-emission electric bus is about 12.5 percent lower than the cost of a diesel bus.[16] Additionally, a study from the California Air Resources Board found that zero-emission electric buses represent a savings of $0.25 per mile compared to diesel.[17] Despite higher up-front costs, zero-emission electric buses are a much more cost-efficient long-term investment than diesel.

---

[13] Alon Levy, "The Verdict's Still Out on Battery-Electric Buses," *CityLab*, 17 January 2019, archived at https://web.archive.org/web/20190920230911/https://www.citylab.com/transportation/2019/01/electric-bus-battery-recharge-new-flyer-byd-proterra-beb/577954/.

[14] Keegan, Matthew. "Shenzhen's Silent Revolution: World's First Fully Electric Bus Fleet Quietens Chinese Megacity." The Guardian. Guardian News and Media, December 12, 2018. https://www.theguardian.com/cities/2018/dec/12/silence-shenzhen-world-first-electric-bus-fleet.

[15] Groom, Nichola. "U.S. Transit Agencies Cautious on Electric Buses despite Bold..." *Reuters* , Thomson Reuters, 13 Dec. 2017, https://www.reuters.com/article/us-transportation-buses-electric-analysi/u-s-transit-agencies-cautious-on-electric-buses-despite-bold-forecasts-idUSKBN1E60GS

[16] Aber, Judah. "Electric Bus Analysis for New York City Transit." Electric Bus Analysis for New York City Transit, Columbia University, May 2016

[17] California Air Resources Board, Literature Review on Transit Bus Maintenance Cost, Aug. 2016, https://www.arb.ca.gov/msprog/bus/maintenance_cost.pdf.