March 2023

Washington Metropolitan Area Transit Authority

Zero-Emission Bus Transition Plan

The Zero-Emission Bus Transition Plan is an actionable plan for Metro to make transit in the National Capital Region increasingly sustainable.

Overview

The Washington Metropolitan Area Transit Authority (Metro) is committed to transitioning its approximately 1,600 Metrobuses to fully zero-emission as quickly as possible. Metro's Zero-Emission Bus (ZEB) Transition Plan provides the path for Metro to transform its fleet, facilities, workforce, and operations by 2042, three years ahead of the Metro Board's adopted goal of 2045.

Transitioning to zero-emissions buses is part of Metro's Better Bus initiative that will improve service, reliability, and customers' experience, while delivering service on buses with no emissions. Customers and residents across the region will

Guiding Principles for Transition Plan Phasing

- **Ensure safety** in all program aspects – design, installation, and operations and maintenance.
- **Integrate equity** in deployment planning and mitigate operational risks to key populations, particularly those of color, low-income, and/or with disabilities.
- **Ensure reliable service** and minimize service disruptions during the transition.
- **Control costs** and manage financial risks.
- **Meet the Metro Board's adopted ZEB goals** while also exploring options for accelerating the transition. In 2021, Metro's Board of Directors adopted a resolution that commits the agency to transition to a 100% zero-emission bus fleet by 2045 and cease the purchase of internal combustion engine buses, including diesel, diesel-hybrid, and compressed natural gas, by 2030.

receive fast, frequent, reliable bus service, along with cleaner air, quieter streets, and lower greenhouse gas emissions. The Transition Plan provides the baseline to transition to ZEB and it will be updated as technologies, markets, and passenger service evolve. Metro will continue to identify opportunities to accelerate the transition.

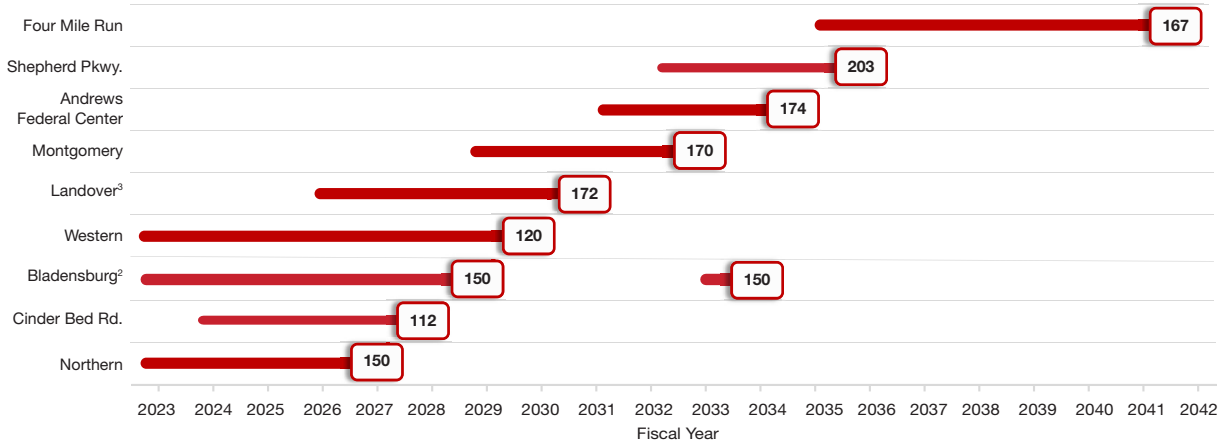
Benefits to the Region

Transitioning to ZEB supports the region's and local jurisdictions' adopted targets and plans to improve air quality, reduce emissions, and mitigate climate change. The Metropolitan Washington Council of Governments has identified ground-level ozone and particulate matter as the two most important pollutants that threaten human health in the region. Transitioning Metro's bus fleet will eliminate tailpipe emissions, including volatile organic compounds and nitrogen oxides that together form ground-level ozone. The transition will also help mitigate climate change by reducing greenhouse gas emissions by an estimated 100,000 metric tons annually compared to the 2022 fleet. Additionally, zero-emission buses are quieter, resulting in less noise on streets and in communities.

Bus Facility Conversion to Support a New Fleet

Transitioning to ZEB is more than just buying new buses, it is also about converting facilities like Metro's nine bus garages where buses are stored, maintained, and fueled. As of March 2023, Northern and Bladensburg bus garages are under construction, with Cinder Bed Road and Western in the planning stages for ZEB conversion. These will be the first facilities to support Metro's ZEB fleet. Phasing the facilities considered facility location and communities served, facility conditions and on-going efforts, continuity of bus service, and local utility capacity. Some newer garages may only require retrofits, allowing a more rapid transition.

Projected Bus Facility Strategy and Timeline[1]



1. *Assumes battery-electric bus conversions.*
2. *Bladensburg Stage 1 enables the garage to support ~150 battery-electric buses; Stage 2 will provide charging infrastructure for the final ~150 battery-electric bus charging spots.*
3. *Landover is a two-phase construction with the first phase's projected completion in FY30 and the second phase projected completion in FY 31.*

Electric Utility Impacts

Transitioning to ZEB also requires large amounts of power to charge battery-electric buses, increasing power needs at each of Metro's nine garages by 12-22 MW. Putting this in perspective, this is the equivalent of powering two commercial buildings the size of the Empire State Building. Metro is and will continue to partner with the region's utility providers — Pepco, Dominion Energy, and BGE — to upgrade infrastructure to provide increased power to these facilities.

Equity

Metro is committed to improving social and racial equity by providing safe, reliable, efficient transit service and diverse and inclusive employment opportunities. Transitioning to ZEBs benefits bus customers and residents across the region by improving air quality, reducing noise, and improving overall quality of life, especially for people who live near garages and along bus routes. These improvements are particularly important for historically disadvantaged communities, particularly those of color, low-income, and/or with disabilities who have disproportionately experienced injustice. An analysis of communities adjacent to garages and along bus routes served by those garages was conducted to understand equity impacts of the proposed investments. Northern and Bladensburg garages, which are both under construction, are high priority from an equity standpoint.

Metro's Workforce

Transitioning to ZEB creates opportunities to develop Metro's workforce for the future, especially those who will operate and maintain the buses. Approximately 800 bus maintenance staff will require training to safely maintain the ZEBs and approximately 2,400 operators will need training to efficiently operate the buses. Metro will develop and incorporate training for employees across the organization to ensure the safety of both employees and customers. With local transit partners also transitioning to ZEB, Metro will work with other providers, manufacturers, and union leadership to develop the next generation bus workforce for the region.

Zero-Emission Bus Technology

Metro is initiating its deployment of zero-emission vehicles with battery-electric bus technology. Battery-electric buses can provide most of Metro's current service. Initial buses will serve routes where current battery-electric bus technology can successfully complete passenger service. Metro anticipates development of zero-emission buses including advances in battery and hydrogen fuel cell technologies and markets over time. As the transition progresses, Metro will continue to evaluate and respond to technological and market evolution.

Investments Needed to Transition

The incremental investments to transition Metrobus are estimated to be approximately $2.3 billion above and beyond the current cost to operate and make investments to support the fossil fueled bus fleet. This includes investments in buses, charging equipment, and infrastructure at facilities, as well as training and maintenance.

Next Steps

Metro has identified the near-term activities to transition to ZEB and meet the Board adopted goals:

Infrastructure

- **Advance design and construction plans for garages targeted for early deployment.** Accelerating these garages will help Metro deliver on its schedule for facility zero-emission bus conversion.

- **Continue actively engaging Pepco, Dominion Energy, and BGE to ensure off-site power infrastructure upgrades are ready when Metro completes construction at individual garages.** The timing of power upgrades is a critical prerequisite for installing charging equipment and ensuring the facility phasing timeline is met – battery-electric buses cannot operate without power.

- **Integrate resilience into facility design.** Shifting to ZEBs increases Metro's reliance on electric power. As Metro converts each bus division to support ZEBs, it will consider resilience solutions that can protect against any service disruptions in the case of power outages.

- **Test and implement charge management systems.** To ensure buses are charged and can meet service needs, Metro must review, test, and implement charge management systems that are integrated with scheduling and yard management systems.

Vehicles/Service

- **Capitalize on Metro's ZEB Deployment: Phase 1 to inform future efforts.** Metro will collect data from its 12-bus deployment to assess bus and charging equipment performance in varying operating conditions, such as hot or cold weather. This will inform how the technology will meet our service and operational needs going forward.

- **Track and evaluate evolving zero-emission bus technology to guide future fleet requirements.** Metro will monitor zero-emission technology and market trends to identify and implement the most viable, cost effective, and feasible ZEB technology in the future.

Workforce

- **Develop comprehensive internal stakeholder engagement and communication plan.** Outreach with Union and Metro's frontline staff will help inform Metro's transition, build consensus on business and workforce planning needs, and empower employees to be a meaningful part of the transition.

- **Prepare workforce for transition.** Ensure Metro's bus operators and mechanics are trained to operate and maintain ZEB.

Programmatic

- **Aggressively pursue funding.** Significant capital and operational investments are required to make ZEB transition a reality. Federal, state, and regional funding opportunities, such as grant funds, will help Metro design facilities, upgrade infrastructure, and train its workforce. Metro will continue to partner with elected officials, utilities, and other regional partners to pursue funding and build support for the transition.

- **Create equity-focused ZEB metrics.** Equity-focused metrics will assist Metro in understanding how the transition is impacting historically disadvantaged communities.

- **Continue to collaborate with other local transit partners in the region.** Metro will continue to partner with local transit agencies to coordinate ZEB activities and seek opportunities to reduce costs and improve coordination. Areas of collaboration include utility coordination, en-route charging, staff training, first responder training, and community outreach and engagement.

Metro's full Zero-Emission Bus Transition Plan is available at wmata.com

2.3 Billion

Above and beyond the operations costs and investments to support the current fossil fueled bus fleet

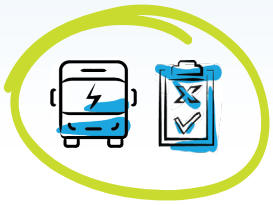
~100,000 metric tons

Greenhouse gas emission reductions per year compared to a 2022 fleet

Zero-Emission Bus Transition Timeline

2023

Deploy buses for Metro's Zero-Emission Bus Deployment: Phase 1



2027

1st operational zero-emission bus garage (Northern) reopens

2031

5/9 of Metro's garages are zero-emission bus ready

2033

50% of Metro's bus fleet is zero-emission

2041

All 9 garages are zero-emission bus ready

2042

100% of Metro's bus fleet is zero-emission