



Zero-Emission Bus Update

Washington Metropolitan Area Transit Authority



Metro connects the Washington region through affordable, sustainable transportation every day. Metro is preparing for zero-emission bus operations. Significant investments in energy infrastructure and new policies must be advanced by the region to enable Metro to take this next step.

Metro makes nearly one million bus and rail passenger trips each weekday and provides the greenest travel option for residents and visitors of the Washington region. The Agency already operates the largest electric fleet in the region, moving over half a million passengers on Metrorail daily.

Building upon the efforts of Metro's first-ever Energy Action Plan, released in 2019, and the Washington Area Bus Transformation Project, Metro is engaging in zero-emission fleet planning to enable a clean and sustainable region, control operating costs and improve the customer experience.

This document lays out the opportunities that zero-emission bus transportation offers the region, reviews actions Metro has already initiated and considers the market, infrastructure and policy prerequisites for success.

Metro cannot achieve the transition to a zero-emission bus fleet alone. Required actions for the region include:

- 1. Energy Infrastructure Investments** – Identify, fund and build utility infrastructure required to operate service
- 2. Policies & Rate Structures** – Establish regional policies and energy rate structures
- 3. Funding for Zero-Emission Buses & Facility Conversion** – Increase funding to replace the existing fleet with cleaner buses

With the transportation sector accounting for the largest percentage of greenhouse gas emissions in the United States, many major metropolitan areas, including ours, have set zero-emission transit goals and made investments in electric buses.

However, transitioning to zero-emission technology on a regional scale requires more than the purchase of new vehicles. This update highlights the additional infrastructure investments and policy changes needed.

Metro intends to support the region in its move to a cleaner transportation future.

Clean, Efficient Bus Service

Metro operates a fleet of almost 1,600 buses serving neighborhoods and business districts across hundreds of square miles. With nearly 400,000 daily riders, Metrobus is crucial to the mobility, prosperity and livability of the national capital region. Currently, Metrobus service is not as clean, efficient and effective as it could be.

The Washington Area Bus Transformation Project has established ways to increase service efficiency for the entire region. In addition, Metro’s Energy Action Plan has identified ways to make bus service cleaner and more energy efficient. Both initiatives recommend adoption of zero-emission bus technologies, and Metro is moving forward to implement these recommendations.

Zero-emission buses bring value to the region by reducing local air pollution, providing a quieter, smoother ride and supporting a more livable and prosperous region.

Already Moving

Over the past year, Metro has moved to create a foundation for greening the fleet. This includes assessing opportunities and challenges associated with the transition to a zero-emission bus fleet.

Metro’s efforts to date consider: the variety of fuel types and technologies and their market readiness; short-term opportunities to integrate investments into existing infrastructure renewal programs and facility rebuilds; the flexibility necessary for a still maturing industry; and how to lay the foundation for a strategic region-wide rollout.

Different types of fuel are being developed to achieve zero-emission public transit, including renewable natural gas (RNG), battery electric technology, and hydrogen fuel cell technology.

Metro has begun implementing the following initiatives:

Opportunities Analysis – Developing an approach to test and evaluate electric vehicle rollout. Metro considered different fuel types and manufacturers, local conditions, grid infrastructure constraints, regional policies and rate structures to design an electric bus test and evaluation to inform regional rollout.

Renewable Natural Gas – Initiating a procurement for renewable natural gas (RNG) for all compressed natural gas (CNG) buses, which will shift 30% of Metro’s bus fleet to low carbon fuel.

Electric Bus Test – Launching a two-year test and evaluation to ensure that different brands of buses and charging technologies can work interchangeably. The test will also establish working relationships with utilities and help ensure engagement on policy and rate structures. In 2020, Metro will issue a request for proposals to test and evaluate up to 14 buses at up to three garages.

Fleet Planning – Integrating zero-emission bus technology into a revised fleet plan in 2020.

Net-Zero Ready Facilities – Incorporating net-zero energy technology considerations into planned bus infrastructure projects. For example, Metro is rebuilding Northern and Bladensburg bus garages and two end-of-line bus turnarounds to be “electric bus ready.” Metro is also identifying potential on-route fueling locations.

BENEFITS	CHALLENGES
 Cleaner air, reduced greenhouse gas and tailpipe emissions	 Additional capital investment in grid infrastructure, facilities, and vehicles
 Quieter vehicles, less vibration, increased comfort	 Major fleet and facility investments with rapidly maturing technology
 Decreased use of fossil fuels, reduced fuel costs	 Fleet lifecycle/replacement timing
 Reduced operation and maintenance costs	 Coordination/partnership

More Than A Bus

Metro’s strategy looks beyond vehicle purchases and identifies the groundwork that must be laid for zero-emission fleet conversion region-wide.

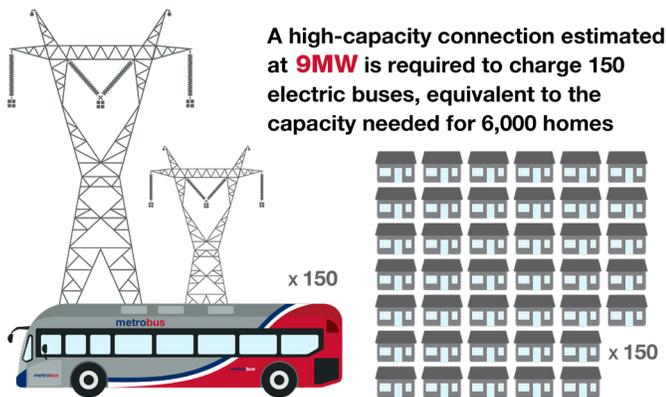
Considerations include:

- Extension of energy infrastructure to fueling locations
- Grid capacity and reliability
- Creation of predictable and affordable rate structures
- Regional policy support and inter-jurisdictional coordination
- Integration of bus availability with fleet planning
- Retrofitting of bus facilities for new fuels and installation of charging stations for new fuels
- Coordination between transit service providers and departments of transportation for shared infrastructure and on-route charging

While there are some actions Metro can undertake on its own, there are steps toward a zero-emission fleet conversion that require regional cooperation and shared commitment. Major stakeholders include bus transit providers, utility owners, utility commissions, regulators and funding partners.

1. Energy Infrastructure Investments

Zero-emission technology requires utility infrastructure different than that which traditional fueling technology requires. New high-capacity grid infrastructure is needed to serve charging locations for battery electric bus service.



For example, Metrobus garages range in size from 100 to 250 buses. The introduction of a zero-emission bus fleet will require the installation of sizable energy infrastructure capable of carrying 9MW of power – the amount demanded by 150 buses or 6,000 homes. 9MW far exceeds the capacity of existing localized grid connections.

At this time, the scale, timing, location and cost of the required regional energy infrastructure investments have not been identified. Before a full rollout of zero-emission buses, the region must prioritize the investments needed and identify funding to pay for them.

To address these considerations, Metro is working with regional partners to identify the needs, costs and funding sources required to move fleet electrification beyond pilots to scalable solutions.

2. Policies & Rate Structures

To move the region together, several policies must be developed in parallel across the jurisdictions. These policies must address rate structures, new frameworks for shared charging infrastructure, utility investment requirements and funding responsibilities.

The formation of new policies and programs will involve collaboration between industries and institutions, including bus transit providers, utilities, public utility commissions, departments of transportation, policy makers and funding partners. In addition to building policy in new cross-functional areas, these collaborations will need to consider risks, uncertainties and rapidly evolving technologies.

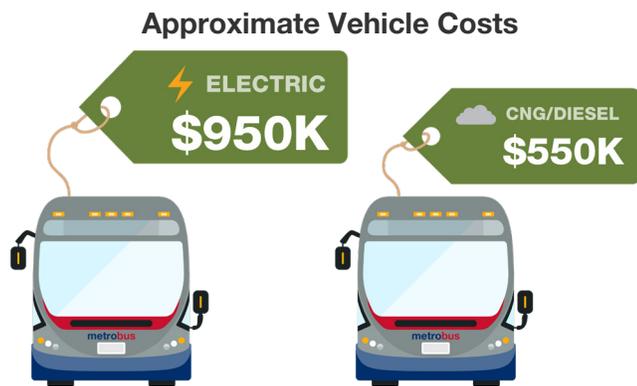
For example, in the case of electric bus technology, there is currently no standard electric utility rate for bus fleet charging. To facilitate a regional switch to cleaner fleets, it is essential that an equitable electric rate structure be developed so that electricity is an economically viable bus fuel. An existing model of such a rate structure is Metro’s Rapid Transit tariff for Metrorail.

Metro is looking forward to working with regional partners to successfully roll out zero-emission transit, establish supportive rate structures and develop regional policies that do not exist today.

3. Funding for Zero-Emission Buses & Facility Conversion

Integrating new technology into the fleet requires facility conversion, fleet planning and workforce development.

Zero-emission technologies, including battery electric buses, have a significantly higher upfront capital cost than traditional compressed natural gas (CNG) or diesel buses. Increased jurisdictional investment will be vital to transitioning Metro's fleet to one that is zero-emission.



Zero-emission buses will also require the conversion of existing facilities to ones that support new fuel technologies. The region will also need to secure funding for facility conversion to zero-emission operations.

Converting the fleet will require a multi-year plan to manage supply and maintenance challenges. For example, Metro's current fleet plan replaces approximately 100 buses per year to ensure consistent average fleet age. In addition, manufacturing capacity for electric buses is currently constrained in the United States while demand for this technology is high.

Metro is proactively engaged in managing the planning, engineering, design, construction and workforce development required to support a transition.

Despite a higher upfront price tag, transitioning to zero-emission service has the potential to reduce operational costs and further Metro's fiscal commitment to jurisdictional funding partners.

A Clean Transportation Future

Zero-emission buses have the potential to provide higher-quality service and significant benefits for the region, but the transition to zero-emission bus service will require significant regional investment and coordination.

Metro is committed to working with our regional partners to address these challenges and provide an even more sustainable transportation future.

Next Steps

In 2020, Metro will continue setting the foundation for a transition to zero-emission bus operations.

- Engage in regional policy and electrification working groups
- Participate in DC Public Utility Commission-approved electrification investment program
- Issue procurement for renewable natural gas (RNG)
- Submit application for Federal Low- or No-Emission Grant program
- Identify required electric utility investment for electrification of Northern and Bladensburg bus garages
- Issue a request for proposals for test and evaluation of up to 14 electric buses and chargers at up to three locations
- Initiate fleet plan revision to account for zero-emission bus technology
- Work with regional departments of transportation and transit agencies to evaluate potential on-route charging locations
- Continue incorporating zero-emission bus technology considerations into planned infrastructure projects