

# Sustainability Vision and Principles and Metrobus Fleet Strategy

Rachel Healy  
Excerpt of Slides Presented at Metro  
Executive Committee  
June 10, 2021



# Sustainability Vision

WMATA provides a sustainable transportation system that meets the needs of people, communities, and businesses in the region, and fosters social wellbeing, equity, economic prosperity, and environmental stewardship.



# Sustainability Principles

Develop and implement an **Action Plan** with specific priorities, strategies and targets to advance sustainability at WMATA and in the region

Recognize that our investments and operational decisions change lives. Make those decisions intentionally to **address historical, social, environmental, economic disparities, and racial and social injustice**

Build, operate and maintain a resilient transportation system to **improve livability, public health, the environment, equity, and access to opportunity**

Leverage the special nature of WMATA's service and our unique market position to **advance regional goals**

# Sustainability Principles

Make **cost-effective and data-driven business decisions** that provide WMATA and our partners with the best return on their investment

Advance the region's sustainability efforts by leading **transparent and authentic collaboration** with stakeholders and community partners

Foster a **culture of** continuous improvement by growing staff capacity and leveraging regional expertise and **innovation**

Establish measurable **performance indicators** to track implementation and successes of WMATA's strategies and actions

# Sustainability Vision and Principles Provide Framework for Policy and Investment Decisions

Recognize sustainability as a core value at Metro

Support cost-effective and data-driven decisions

Advance regional sustainability and resilience goals

Engage strategically with partners

Help guide long range planning and investment decisions

Support livable communities – improve equity, the environment, access to opportunity

# Detailed Vehicle Emissions by Fuel Type

Bus Type	Clean Diesel	Diesel Electric Hybrid	Compressed Natural Gas	Renewable Compressed Natural Gas	Battery Electric	Hydrogen Fuel Cell
<b>Annual Total Greenhouse Gases</b>						
<b>Annual Total Pollutants</b>						
<b>GHG (short tons)</b>	122.2	97.6	87.8	16.5	25.0	63.0
<b>CO (pounds)</b>	186.3	102.9	1861.4	1687.4	21.1	96.4
<b>NOx (pounds)</b>	299.0	287.5	115.5	-11.4	35.3	161.2
<b>PM10 (pounds)</b>	16.0	15.3	14.0	0.4	16.3	32.5
<b>PM2.5 (pounds)</b>	5.1	4.5	3.2	-10.3	3.7	11.6
<b>VOC (pounds)</b>	28.9	25.2	31.8	-57.5	6.0	27.4
<b>Annual Vehicle Operation Pollutants</b>						
<b>CO (pounds)</b>	154.7	77.4	1779.6	1779.6	0.0	0.0
<b>NOx (pounds)</b>	239.0	239.0	12.0	12.0	0.0	0.0
<b>PM10 (pounds)</b>	12.1	12.1	12.1	12.1	11.7	11.7
<b>PM2.5 (pounds)</b>	1.9	1.9	1.9	1.9	1.5	1.5
<b>VOC (pounds)</b>	9.7	9.7	6.1	6.1	0.0	0.0
<b>Annual Upstream Pollutants</b>						
<b>CO (pounds)</b>	31.6	25.5	81.8	-92.2	21.1	96.4
<b>NOx (pounds)</b>	60.0	48.5	103.5	-23.3	35.3	161.2
<b>PM10 (pounds)</b>	3.8	3.1	1.9	-11.7	4.6	20.8
<b>PM2.5 (pounds)</b>	3.2	2.6	1.3	-12.2	2.2	10.1
<b>VOC (pounds)</b>	19.2	15.5	25.7	-63.7	6.0	27.4

1 – Assumed emphasis on landfill gas, which Washington Gas notes as the most readily available in the region. Renewable natural gas, when made from waste that would usually emit methane, has negative emission values in cases where emissions avoided from the waste's conversion to RNG outweigh any emissions that would be caused from fuel production, transportation and use in a transit vehicle.

2 – While they do not produce tailpipe emissions as conventional vehicles do, electric and hydrogen fuel cell buses, like all transit buses, generate particulate matter emissions during vehicle operation. Sources of this particulate matter include those produced by friction on brakes, tires, and road surfaces, as well as the suspension of road dust.

Source: EPA bus emissions data and 2020 Department of Energy Argonne National Laboratory model.



# Sustainability Vision and Principles and Metrobus Fleet Strategy

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## Current and Upcoming Electric Bus Activities

### ▪ **Electric Bus Test & Evaluation**

- Pilot program operating out of Shepherd Parkway to include deployment, testing and evaluation of ~10 standard-length electric buses and ~2 articulated electric buses.
- Project work is ongoing, with bus deliveries expected in early FY2023 and project closeout completed by mid-FY2024.

### ▪ **Continued Coordination with Electric Utilities**

- Staff working with local electric utilities to define future fleet electrification requirements and outline requirements for successful integration with grid infrastructure.

### ▪ **Evaluation of Additional Funding Sources**

- Staff reviewing potential opportunities for funding support of electric bus technology adoption, including federal programs and grants.

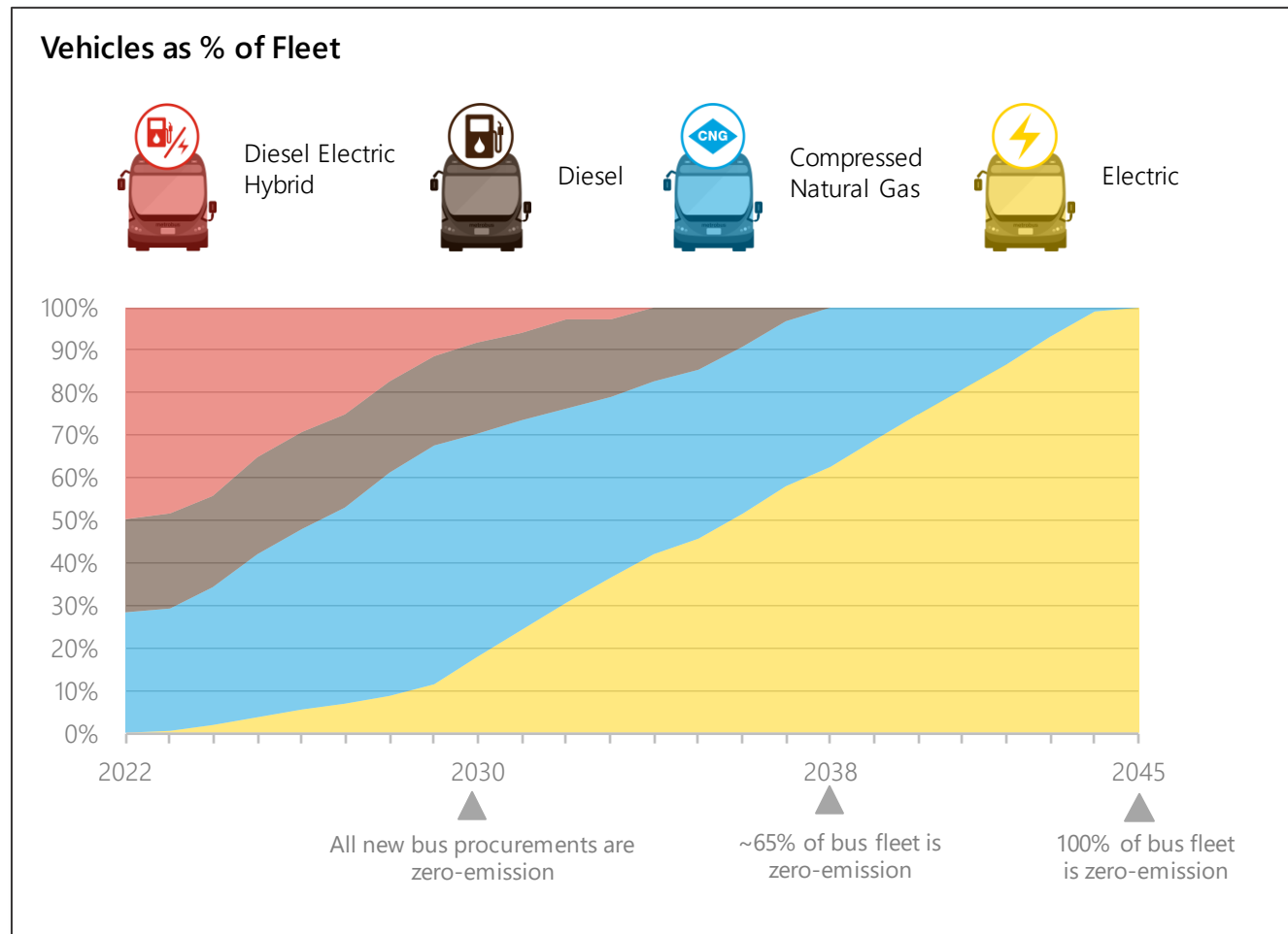




# Current and Upcoming Electric Bus Activities

- **Upcoming Five-Year Bus Procurement**
  - Development of Metro's next five-year bus procurement contract, including vehicle specifications.
  - Initial procurement development is ongoing, with issuance of request for proposals expected in FY2022. Contract bus deliveries to begin in FY2024.
- **Hiring of Program Management Team**
  - Expansion of staff support required to manage program associated with fleet electrification. Hiring activities underway.
- **Planning and Capital Project Development for Garage Electrification**
  - Development and evaluation of capital projects to expand Metro capacity to support, maintain, charge and store electric buses. Identification of sequencing and timing of garage conversion to support future fleet needs.
- **Exploration of Potential Hydrogen Fuel Cell Bus Test and Evaluation**
  - Staff to review potential program structure, implementation options and funding sources for test and evaluation of hydrogen fuel cell bus technologies.

# Draft Strategy: Fuel Mix Implications



- **Flexibility and adaptability** considered in draft strategy, especially as technologies emerge and develop
- Draft target of 100% of new bus procurements to be **zero-emission by 2030**, **~65% zero-emission** fleet by 2038, **100% zero-emission** fleet by 2045
- Hydrogen fuel cell and other zero-emission bus types considered and evaluated in future

## Draft Strategy: Electric Bus Support, Facility Requirements

Conversion of Metro facilities to support electric buses requires investment

- **Charging equipment:** Chargers (plug-in, pantograph, etc.), conduits, transformers and other equipment must be installed in each garage offering electric bus support.
  - Potential exploration of in-route charging infrastructure, depending on deployment factors and fleet needs
- **Garage configuration:** Ceiling height, parking, and maintenance area dimensions and layouts likely to impact support for new bus technology.
- **Workforce opportunities and collaboration with labor:** New vehicle technologies will require new maintenance skillsets and training protocols, offer new skills and job training opportunities for workforce in the region.
- **Parts and materials storage:** New bus technology requires new parts inventories and other supporting materials and equipment.
- **Operational and safety considerations:** Time required for charging, operator role in bus charging likely to impact operations and require planning and review. Further modifications expected to ensure facility safety.

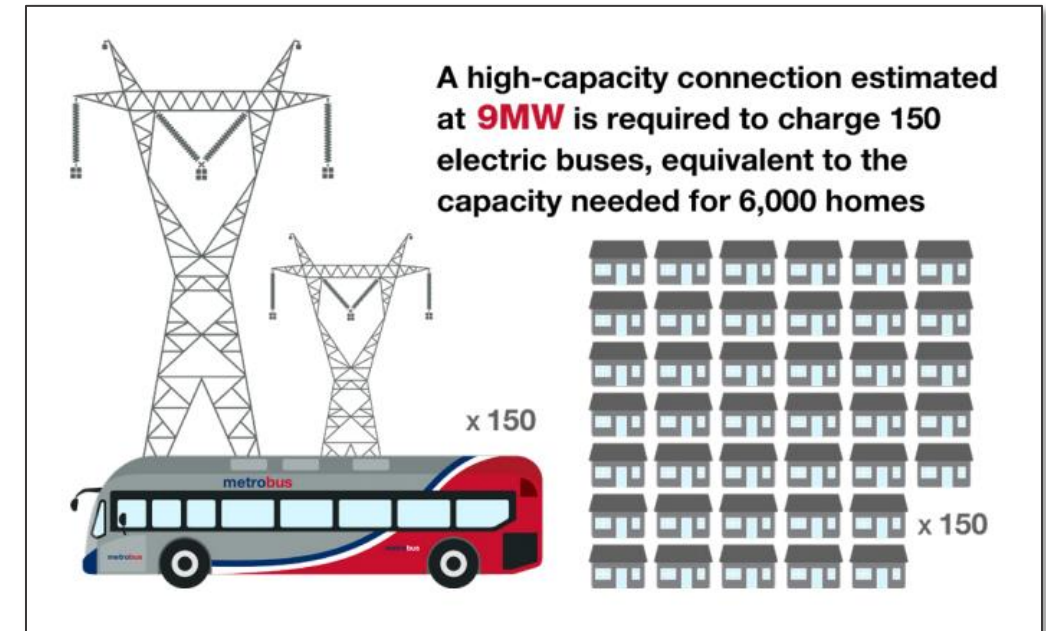
**Facilities are the critical path to transition**  
Some factors within Metro's control, others to require regional coordination and support



Conceptual design of Division Charging Infrastructure  
Source: LA Metro, ZEBGO December 2019

## Draft Strategy: Electric Utility Support Requirements

- **9 megawatts of high-capacity electric connection** required to support a garage of 150 electric buses. This level of support exceeds the capacity of existing localized grid connections.
- **Average Metro operating division** currently houses 150-160 vehicles, with capacities as low as 83 and as high as 300 when Bladensburg construction work is complete.
- Time of day and peak demand fees for charging introduce additional complexity.
- Collaboration to address frameworks for **shared charging infrastructure, utility investment requirements and funding responsibilities**. Equitable electric **rate structure** to ensure economic viability of electric bus fleet.



Source: Metro Zero-Emission Bus Update

# Draft Fleet Strategy: Transformational Investment Opportunity

- Increased capital costs:
  - Electric bus acquisition cost approximately **~\$300,000** higher (~45%) than diesel bus.
  - Average infrastructure cost per electric bus of **~\$400,000** per bus, based on preliminary peer agency project cost estimates. Suggests approximate project cost of **~\$60m** for single 150-bus garage.
  - Approach to support electric charging infrastructure likely to differ by location:
    - Incremental addition to active major projects (e.g., Northern, Bladensburg). Lower incremental cost than retrofit or facility replacement.
    - Retrofitting of existing facilities (e.g., Andrews Federal Center, Four Mile, Shepherd Parkway).
    - Conversion likely to require facility replacement (e.g., Western).

Figures represent order of magnitude estimates based on external benchmarks and experiences of peer transit agencies. Not official estimates; additional work required for development of projects at Metro facilities.

**Draft Strategy Order of Magnitude Estimated Incremental Capital Costs**

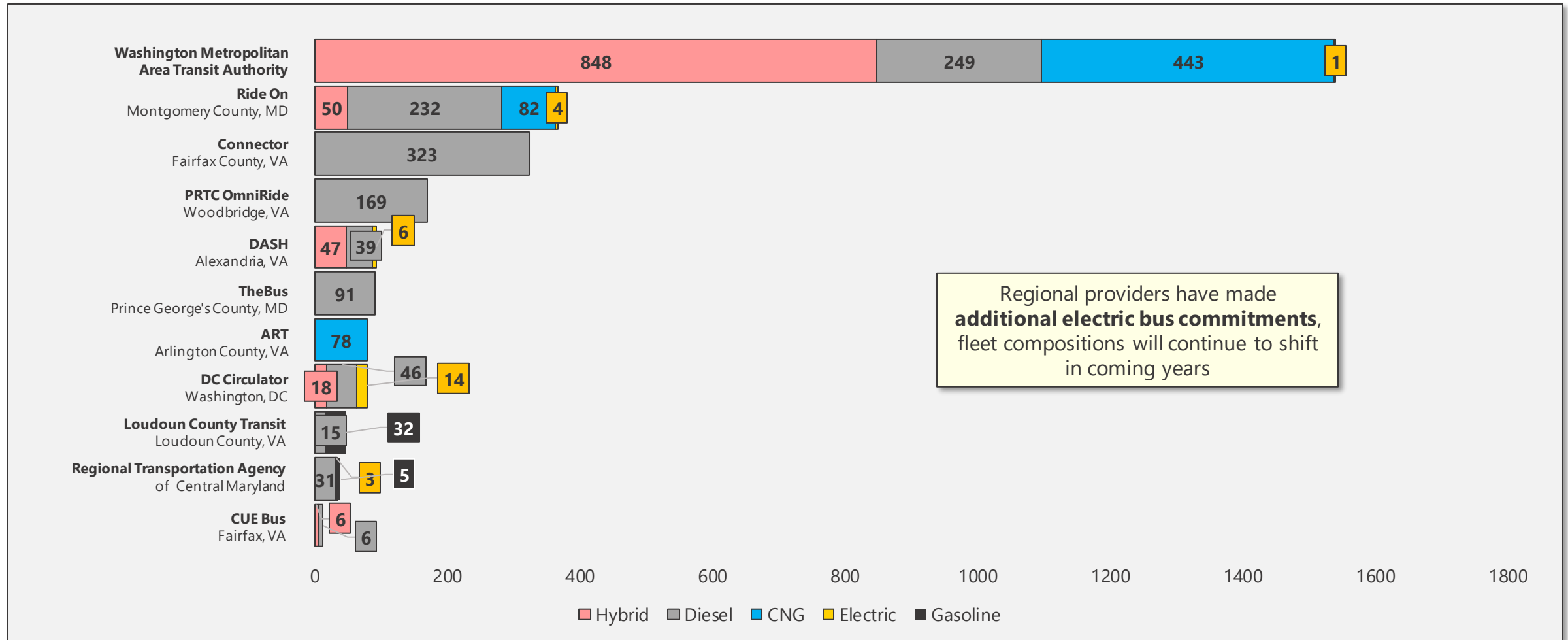
Period	Incremental Capital Cost Estimate
6-Year Capital Program (FY22-FY27)	~\$125-200m
10-Year Capital Plan (FY22-FY31)	~\$400-500m
Draft Fleet Strategy (FY22-FY38)	~\$900m-1b



# Appendix



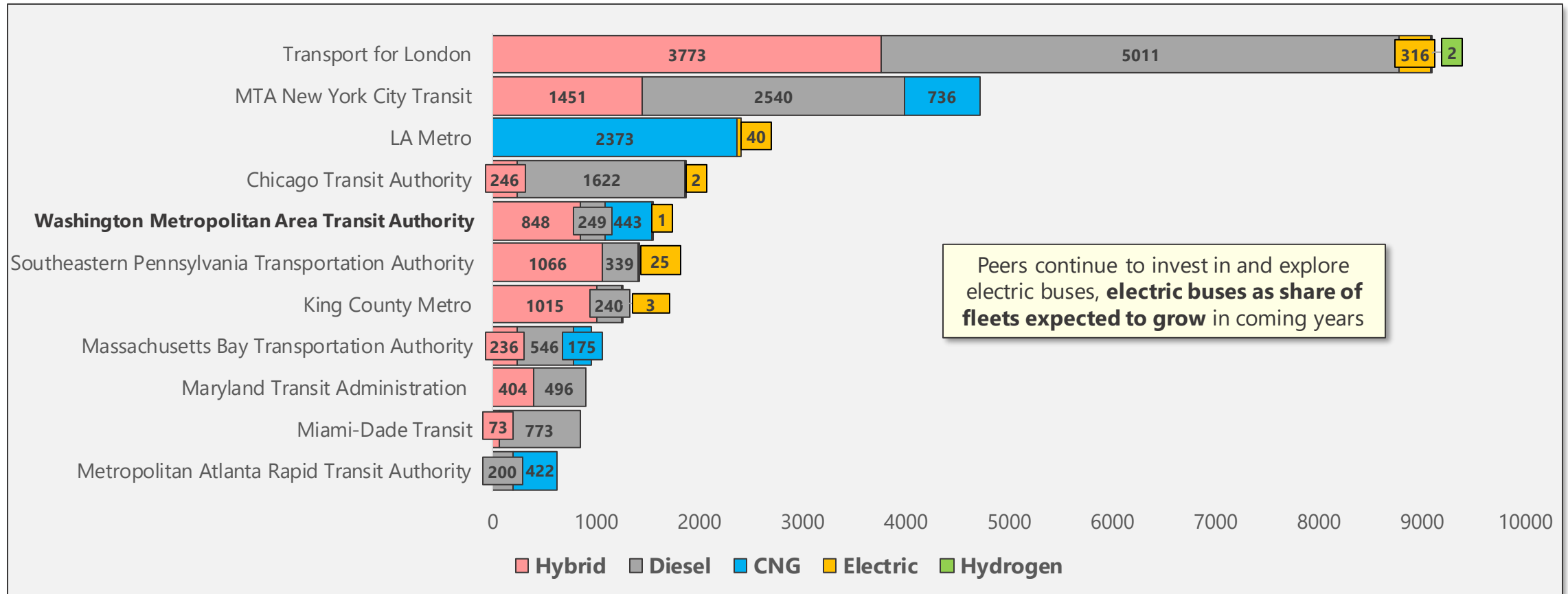
# Fleet Composition, Regional Providers



Regional Provider Source: American Public Transportation Association (APTA), Public Transportation Vehicle Database  
 Figures shown for most recent available data from each peer agency, does not include commuter buses or paratransit vehicles  
 Fairfax County recently announced plans to add four electric buses to the Connector fleet



# Fleet Composition, Peer Transit Agencies



Source for US Peers: American Public Transportation Association (APTA), Public Transportation Vehicle Database  
 Source for Transport for London: Agency-published bus fleet data, March 2020  
 Data shown for most recent available data from each peer agency

