The Metrorail system is the second busiest in the United States providing transit service for more than 600,000 customers a day throughout the Washington, DC area.

Metrobus is the sixth busiest bus agency in the United States providing over 400,000 trips each weekday to a population of 3.9 million within the 1,500 square miles of Metrobus service area.
Steps WMATA has Taken

- WMATA has recently concluded an assessment of electric vehicle technology for the service area.
- In 2020, WMATA will begin preparations for a two-year focused test and evaluation of how different manufacturers’ electric bus and charging technologies can form a large-scale zero-emissions fleet to serve the region.
- Re-construction of two bus facilities that will be “electric bus ready”. These facilities will phase in Metro’s future transition into zero-emission fleet technology.
Not Just the Bus

- Substantial new electric infrastructure requirements at bus garages
- Electric bus utility rates are not yet defined locally
- New skills and transition plan required for the workforce
- Parts, procurement and maintenance processes must adapt
- Must consider route planning and technology options

Primary Benefits

- Reduced fuel costs; less dependency on fossil fuels
- Fewer greenhouse gases, NOx emissions; & particulate matter
- Quieter vehicles; less vibration; greater comfort
- Reduced operations & maintenance costs
Assessment Goals

- **Infrastructure**
  - Case Studies
  - Energy needs, charging infrastructure

- **Planning**
  - Facility and route selection

- **Electric Bus Fleet**
  - Assessment and modeling

- **Financial**
  - Cost analysis

Test and Evaluation
Energy Impacts and Requirements

- Full deployment of electric buses will put a large amount of stress on the utility grid
- WMATA can employ technologies to mitigate the risk potential associated with charging electric buses at Metrobus facilities
Facility Capacity

- Ground mounted chargers will reduce parking capacity approximately 40%
- Overhead chargers will reduce parking capacity less than 10%
Route Planning

- 90 percent of existing routes can be operated with a standard-sized electric bus battery without any changes to the schedule.

- The remaining 10 percent would need to recharge at the depot during midday, do opportunity charging at a layover location, or have its schedule changed.
# Bus Charging Alternatives and Impacts

<table>
<thead>
<tr>
<th>Charging Alternative</th>
<th>Charging Locations &amp; Times of Day</th>
<th>Schedule Impacts</th>
<th>Estimated Increase of Buses Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overnight charging, depot only</td>
<td>At divisions overnight</td>
<td>Would need to break up blocks that are too long</td>
<td>533</td>
</tr>
<tr>
<td>Overnight + daytime depot charging only</td>
<td>At divisions at all times</td>
<td>Would need to break up blocks that are too long</td>
<td>69</td>
</tr>
<tr>
<td>Overnight and in-route charging</td>
<td>At divisions overnight and in-route at all hours</td>
<td>May have to lengthen layover times to allow for charging</td>
<td>0</td>
</tr>
<tr>
<td>Overnight, daytime, and in-route charging</td>
<td>At divisions and in-route locations at all times</td>
<td>No impact</td>
<td>0</td>
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<tr>
<td>In-route charging only</td>
<td>All times at in-route locations</td>
<td>Would have to lengthen layover times to allow for charging</td>
<td>115</td>
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</tbody>
</table>
Bus Charging Requirements

- **Depot Charging**
  - Lower infrastructure costs
  - Potentially lower electricity
  - Limited bus range

- **In-Route Charging**
  - No limitation on daily bus range
  - No loss of depot parking capacity
  - Potentially higher electricity costs
  - Higher infrastructure costs
  - Must add time to existing schedules
Financial Considerations

- Operating costs will fall with the adoption of electric buses
- Additional capital funding is required due to the higher vehicle and infrastructure costs
- The emissions savings are significant
- An equitable electric rate structure must be developed