

FCDOT Responses to Questions for Staff from December 5th JET Transportation Sub-committee

- 1. Could County staff provide carbon footprint data from the MWCOG report for:
Fairfax Connector buses
Fairfax staff and other vehicles**

Response: FCDOT staff contacted MWCOG about their ability to help answer this question, FCDOT was informed that they could not provide that data. Staff at MWCOG referred FCDOT to other carbon footprint calculators that may be available. FCDOT is pursuing the calculations for the bus fleet only. The Department of Vehicle Services (DVS) is the point of contact for the other county vehicles.

- 2. What is the current plan to acquire cleaner Fairfax Connector buses?**

Response: The current fleet of Fairfax Connector buses utilizes Clean Diesel technology that meets the US EPA emission standards for each of the model years the buses were built. Over the years, diesel engines have become 'cleaner' with regards to emissions which have dropped dramatically (See Table 1 – US EPA Emission Standards for Heavy-Duty Engines). Aside from more efficient engines, transit buses have adopted new after-treatment technology specifically designed to reduce the higher levels of emissions. This technology is credited with the drop in Nitrogen Oxide (NOx) and Particulate Matter (PM) between 2004 and 2007 as shown on Table 1. Currently FCDOT is reviewing new technologies, particularly in preparation for the Bus Rapid Transit system in the Richmond Highway Corridor. Short-term: Continue to purchase Clean Diesel buses until the desired long-term propulsion technology is developed. Medium-term: Electric-powered buses are one possible solution to zero emission vehicles. FCDOT is monitoring several pilot projects underway around the country. Further evaluation will help determine long-term financial and operability considerations of new technologies. FCDOT's goal is to learn from other technology deployments for commercial fleets, so that lessons learned can be applied. At this point, the technology is still evolving, and different operating environments can pose significant challenges to implementation of any large-scale conversion. FCDOT is considering pursuing grant opportunities with the Virginia Department of Rail and Public Transportation for the purchase of electric vehicles in the next two to three years.

- 3. What is the current plan to acquire cleaner Fairfax County staff and other vehicles?**

Response: This question should be answered by DVS.

- 4. For all the above, what is the mix of fuels being considered?**

Response: Currently, FCDOT uses Ultra Low Sulfur Diesel (ULSD) that is required by federal regulations. This fuel is the only one being considered for the short-term as it is required to be used with today's engines to meet emission standards. In the medium-term, FCDOT is considering electric buses.

**Table 1 - USEPA Emission Standards for Heavy-Duty Engines
(in grams per brake-horsepower per hour - g/bhp/hr)**

Year	CO	HC ^a	HC ^a +NO _x	NO _x	PM	
					General	Urban Bus
1974	40	-	16	-	-	
1979	25	1.5	10	-	-	
1985	15.5	1.3	-	10.7	-	
1987	15.5	1.3	-	10.7	0.60	
1988	15.5	1.3	-	10.7	0.60	
1990	15.5	1.3	-	6.0	0.60	
1991	15.5	1.3	-	5.0	0.25	0.25
1993	15.5	1.3	-	5.0	0.25	0.10
1994	15.5	1.3	-	5.0	0.10	0.07
1996	15.5	1.3	-	5.0 ^e	0.10	0.05
1998	15.5	1.3	-	4.0	0.10	0.05
2004	15.5	-	2.4	-	0.10	0.05
2007	15.5	0.14	-	0.20	0.01	
2015	15.5	0.14	-	0.02	0.01	

5. What is the current plan for providing alternative fuel infrastructure for these cleaner vehicles?

Response: No other fuel is under consideration for short-term use. Other alternative fuels (CNG, LPG, Propane, Hydrogen) require their own engines, special onboard storage requirements and completely unique fueling infrastructures. The capital infrastructure and additional vehicle costs for a pressurized fuel can be significant and cost prohibitive. Use of pressurized fuels does not provide a zero-emission vehicle as these engines still emit greenhouse gases. Use of bio-diesel blends were considered, but the current engine manufacturer limits the amount that can be used before cancelling the warranties. Bio-diesel blends are considered as renewable energy sources rather than a cleaner fuel, this is especially valid when there are only minimal emission reductions from the smaller quantities blended into diesel (as required by the engine manufacturer). In the medium-term, FCDOT is considering piloting electric buses, including the infrastructure that will be needed to charge them.

6. Could you please provide the ages of Fairfax County vehicles?

Response: The current fleet of Fairfax Connector has an average age of 9.4 years (See Table 2 – Fairfax Connector Fleet Age).

Table 2 – Fairfax Connector Fleet Age

Model Year	Manufacturer	No. of Buses
2007	New Flyer	68
2008	Orion	26
2009	New Flyer	45
2011	New Flyer	68
2012	New Flyer	35
2013	New Flyer	19
2014	New Flyer	17
2015	New Flyer	17
2018	New Flyer	14
2019	New Flyer	4
Avg. Fleet Age	9.37	

7. What are the replacement schedules for Fairfax County vehicles?

Response: FCDOT has set the life cycle for a transit bus at 15 years, which is 3 years longer than the federal funding requirement of 12 years. Depending on capital budget dollars vehicles may be kept longer.

8. FCDOT staff to provide an overview of existing transportation inventory and conditions and what are their plans (if any) to reduce/eliminate GHG emission levels? What are the barriers and/or constraints that limit the scope of these plans?

Response: Maximizing the use of transit service versus single occupancy vehicles has long been an important strategy to reduce air pollution. FCDOT has extensive programs to encourage travelers to shift from single occupancy vehicles to the buses, as well as rail, carpools and vanpools through transportation demand management strategies. Plans to optimize five major transit service areas in the County are underway to improve access to public transportation and increase ridership. FCDOT efforts to encourage alternative modes of mobility (ridesharing, bicycling and walking) is ongoing also. Finally, the County Board of Supervisors has been instrumental in approving new developments near transit hubs which maximizes land use and transit investment, thereby creating more sustainable communities.

FCDOT's long-term plan for its fleet will likely be focused on the use of electric-powered buses. FCDOT is progressing towards this goal cautiously as the technology is still developing and needs to overcome obstacles necessary to meet the life cycle demands of a transit bus. Specific concerns include the vehicle operating range and

cold weather operations. These concerns hinder the duty cycles of transit buses that can be kept in service up to 14 to 16 hours a day. Additional concerns include battery life, obtaining qualified technicians to maintain maintenance requirements, training emergency staff to respond to electric bus incidents, engineering charging stations for large bus fleets, ensuring enough electrical supply and costs for charging, and development of new operational procedures.

Finally, electric-powered buses cost 40% to 50% more than conventional diesel buses and the added financial considerations must be considered. According to the American Public Transit Association the average electric bus cost \$930,000 in 2018. Currently, our price of a Clean Diesel bus is \$530,000. Changing to other alternative power source requires changes in infrastructure requiring significant capital investment. These factors require pre-planning and financial commitment as FCDOT would begin to phase in the more expensive vehicles over time.