

City of Alexandria, Virginia

MEMORANDUM

DATE: APRIL 15, 2011

TO: THE HONORABLE MAYOR AND MEMBERS OF CITY COUNCIL

FROM: JAMES HARTMANN, CITY MANAGER 

SUBJECT: BUDGET MEMO # 67: LIFECYCLE COST COMPARISON OF CLEAN DIESEL AND HYBRID DASH BUSES

This memorandum is provided in response to City Council discussion at the February 22, 2011 work session with DASH and the ATC Board of Directors. Specifically, this memo describes the estimated lifecycle costs (measured in FY 2012 dollars) associated with clean diesel and hybrid buses.

The total cost for hybrid and clean diesel buses are dependent upon cost items that may vary significantly from year to year such as fuel prices, vehicle parts and maintenance. For this analysis, only the major cost components, capital cost, fuel cost (based on existing prices), and maintenance, have been included in the cost comparison between hybrid and clean diesel buses.

Typically a hybrid bus can save an average of 30 percent in fuel cost and maintenance each year as compared to a clean diesel bus. Both the hybrid and the clean diesel bus have a life expectancy of 12 years. Over 12 years, the total lifecycle cost for a hybrid bus is higher than the total cost for a clean diesel bus primarily due to the fact that the initial capital cost for a hybrid is approximately \$170,000 more than a clean diesel bus and the \$60,000 hybrid lithium battery needs to be replaced after seven years of operation of a hybrid bus.

As shown in Table 1 below, the lifecycle capital and fuel costs of a hybrid bus are approximately \$108,000 more than the lifecycle costs of a clean diesel bus, or \$9,000 per year. The lifecycle maintenance cost for a hybrid is lower than the lifecycle maintenance cost for a clean diesel bus. Overall, the total lifecycle cost of a hybrid is approximately \$103,000 more than the total lifecycle cost of a clean diesel bus, or \$8,593 per year.

As an offset to the higher costs, a hybrid bus is significantly better environmentally than a clean diesel bus due to its lower emissions output and its reduction of engine noise, which is important when running buses in residential neighborhoods. Purchasing hybrid buses is consistent with the City's Eco-City Plan. There is no difference with respect to the ability to maintain the buses because the DASH facilities are adequately setup to maintain hybrid and clean diesel buses.

The lower lifecycle cost for the clean diesel bus was calculated assuming existing fuel prices. However, if fuel prices continue to increase, the difference in lifecycle cost between the two vehicle types will be narrowed.

Table 1 - Life Cycle Costs			
Initial Capital Cost and Fuel Cost Calculation		Clean Diesel Bus	Hybrid Bus
A	Initial Cost of Vehicle	\$480,000	\$650,000
B	Diesel Fuel Cost Per Year	\$17,200	\$12,040
C	Life of Vehicle in Years	12	12
D	Fuel Cost for Life of Vehicle* (CxB)	\$206,400	\$144,480
E	Life-Cycle Cost of Vehicle Excluding Maintenance (A+D)	\$686,400	\$794,480
Maintenance Cost Calculation		Clean Diesel Bus	Hybrid Bus
F	Annual Vehicle Miles	30,000	30,000
G	Maintenance Cost per Mile	\$0.58	\$0.40
H	Annual Maintenance Cost per Vehicle (FxG)	\$17,400	\$12,000
I	Hybrid Battery Replacement	\$0	\$60,000
J	Life-Cycle Maintenance Cost per Vehicle (CxH+I)	\$208,800	\$204,000
		Clean Diesel Bus	Hybrid Bus
K	Total Life Cycle Cost per Vehicle (J+E)	\$895,200	\$998,480

* Assumes existing fuel prices throughout the 12 year life span of the vehicle.

Since the lifecycle cost of a hybrid bus is only 10 percent more than a clean diesel bus and the gap in lifecycle cost is expected to be narrowed with increased fuel prices, and since the hybrid buses are significantly better than the clean diesel buses from the emissions and noise perspective, it is generally recommended that the City continue its practice of acquiring hybrid buses to replace and expand the DASH fleet when sufficient resources are available. It is important to note that the Proposed CIP does not have sufficient funding in FY 2012 – FY 2016 to support the purchase of hybrid buses while staying up-to-date on the planned replacement program for the existing DASH fleet. Without additional resources during this period, the City will have to look at refurbishing DASH buses at an estimated cost of \$155,000 in order to keep up with the replacement program.