
METRO TRANSIT

TO: MEMBERS OF THE TRANSIT AND PARKING COMMISSION
FROM: ANN GULLICKSON
SUBJECT: FIRST YEAR'S EXPERIENCE WITH HYBRIDS
DATE: 4/7/2009

The five Gillig Low-Floor Diesel-Electric Hybrid buses were placed in service in October 2007. We now have better than a year's experience with the buses in a daily operating environment. To evaluate our experience with these buses, Maintenance Manager Jim Drengson and his staff have been collecting data and monitoring their performance, in comparison with a group of Gillig Low-Floor Diesel buses purchased one year earlier than the hybrids. This report looks at several areas; emissions, purchase price, maintenance cost, and fuel economy.

Emissions: Reducing global climate change is a City of Madison priority. The acquisition of diesel electric hybrid buses was seen as a cost effective tool to help Metro enhance the sustainability of our operations. According to a study conducted in 2006 by the National Renewable Energy Laboratory, transit buses with the GM-Allison hybrid technology and state of the art engine exhaust filter reduce emissions of nitrogen oxides (NOx) up to 39 percent, particulate matter (PM) up to 97 percent, carbon monoxide up to 60 percent and hydrocarbons up to 75 percent.

While we did not come into this project with the expectation that the hybrid buses would save money compared to traditional diesel buses, we did project that fuel savings would bring us close to 'breaking even' over the life of the bus.

Acquisition: A disadvantage to hybrids is the higher purchase price. Madison purchased three hybrid buses for \$489,993, and two for \$495,320. The buses in campus service are more expensive due to a different seating arrangement, a street side destination sign and a wider rear door. A comparable Gillig Low-Floor Diesel buses purchased in 2006 would have cost \$306,000, a difference of approx. \$186,000. The City of Madison's share of the cost is 20%, with 80% capital funding from the Federal Transit Administration, bringing the cost difference down to \$37,225.

Maintenance: The maintenance cost for the hybrid buses has been comparable to diesel buses in their first year. Based on the experience of transit systems that have had hybrids in service longer than Madison, we expect the routine monthly maintenance costs to continue to run parallel to diesel buses. The one exception to this is the battery. At some point over the live of the bus, we anticipate replacing the battery. This will be a one-time cost of approximately \$45,000.

Fuel: 2008 was a volatile year for fuel prices. For the first nine months of the year we floated with the market, and purchased fuel at prices ranging from a low of \$2.24 to a high of \$4.14. We locked in a fuel price of \$3.38 in the last quarter. Our average price per gallon for the year was \$3.32. The hybrids achieved 5.43 mpg compared to 4.28 mpg for our

newest diesel buses, 26.9% better in fuel economy. The applications that benefit most from the diesel-electric hybrid technology are those that are driven in stop-and-go conditions. The operating environment on campus is advantageous for the hybrids, and we see the campus hybrids outperforming campus diesel buses 34.9% in fuel consumption.

The cost information is summarized on the chart shown below. The higher acquisition price and the necessity to replace the battery result in an annualized capital cost that is \$6,852 higher than a traditional diesel bus. Savings in fuel consumed offsets this, however. The chart shows the fuel savings at several different price levels for fuel. An average fuel cost of \$4.50/gallon over the twelve-year life of the buses comes close to a 'break-even' point.

Annualized Capital and Fuel Costs

	Diesel	Hybrid	Difference
Cost of Bus	\$306,000	\$492,123	\$186,123
Federal 80%	\$244,800	\$393,698	\$148,898
Local 20%	\$61,200	\$98,425	\$37,225
Acquisition (20% over 12 yrs)	\$5,100	\$8,202	\$3,102
Battery (one at \$45,000)	N/A	\$3,750	\$3,750
Annualized Capital Cost	\$5,100	\$11,952	\$6,852

Annual Savings from Fuel

Fuel at \$2.50	\$18,293	\$14,535	(\$3,758)
Fuel at \$3.50	\$25,610	\$20,349	(\$5,261)
Fuel at \$4.50	\$32,927	\$26,163	(\$6,764)

Assumes 30,000 avg miles/yr, 4.1 mpg diesel, 5.16 mpg hybrid