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Plug-in Hybrid Electric School Bus Project

2010 Activities

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This document was prepared by Advanced Energy.

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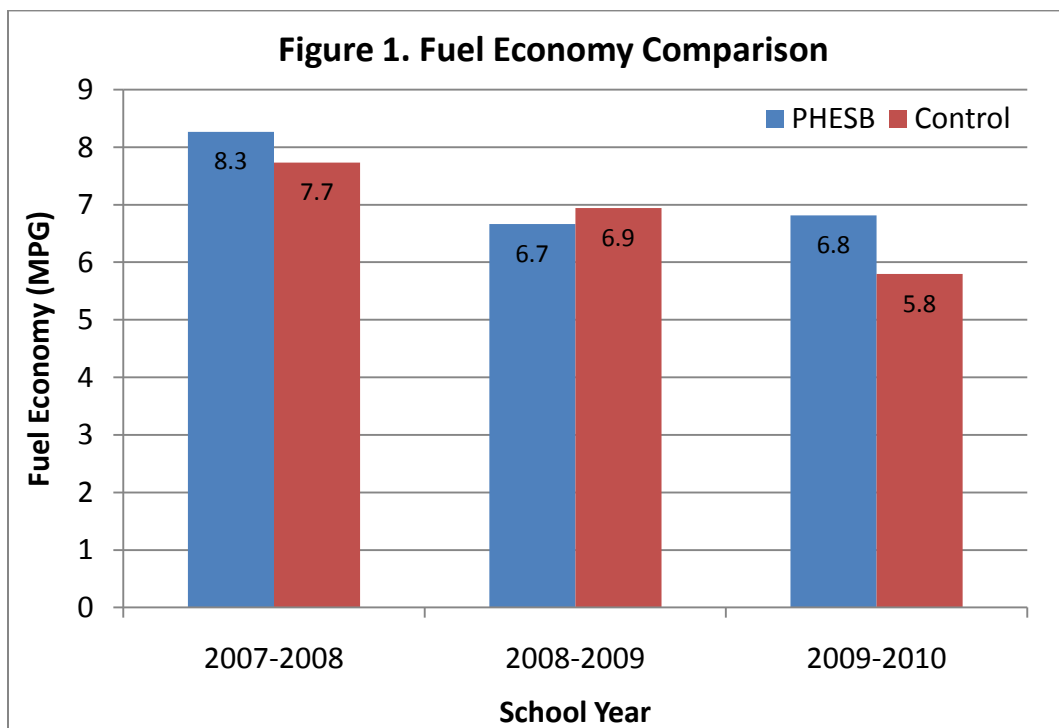
Staci Haggis, Advanced Energy

Activities in recent years for the plug-in hybrid electric school bus (PHESB) project have focused on monitoring bus performance and troubleshooting bus reliability and maintenance issues. In 2010, Advanced Energy shifted focus to wrapping up involvement with the first generation of IC Bus PHESBs. Advanced Energy continues to serve as a resource for all districts with first generation buses, but has scaled back testing and monitoring of the overall fleet. Advanced Energy also continues to respond to numerous inquiries from the public about the program.

In early 2010, Advanced Energy released the PHESB 2010 Program Report. The report contains a summary of the previous three years of work on the project, including how the program began, why school buses were chosen for plug-in hybrid technology and how the project has evolved. The report also features discussions on the three main stages of the project – the preliminary feasibility studies, pre-production and manufacturing, and fleet testing and monitoring. The report can be found in the Knowledge Library section of Advanced Energy’s website (www.advancedenergy.org/transportation/phesb/knowledge_library.php).

Advanced Energy’s 2010 PHESB program plan also included continued focus on the Wake County, NC bus. Advanced Energy worked with Wake County to continue evaluating ways in which to improve bus performance and reliability. In early 2010, Advanced Energy held a meeting with Wake County Public Schools transportation officials concerning their needs for 2010 support. They indicated a desire for Advanced Energy to characterize the fuel economy of their bus and to investigate the comparison between standard bus maintenance histories and the PHESB maintenance history. Advanced Energy acquired the supporting information for this analysis from the NC Department of Public Instruction, which compiles basic fuel and maintenance records for each bus in the NC school bus fleet.

Figure 1 shows the lifetime fuel economy of Wake County’s PHESB compared to its control bus.



Overall, the PHESB has achieved greater lifetime fuel economy than the control bus: 7.3 miles per gallon (mpg) for the plug-in hybrid versus 6.8 mpg for the control bus. This is an approximately 7 percent improvement. The 2008-2009 school year shows a reverse in that trend. Advanced Energy speculates that this is due to reliability and maintenance problems with the bus in that school year. The fuel economy achieved by the PHESB dropped in 2008 and has not returned to the level achieved in its first year in operation. In the 2009-2010 school year, PHESB fuel economy stayed close to that of the 2008-2009 school year. There were additional maintenance issues with the bus in the first part of that year, but the bus performed consistently better in the latter half of the year. Control bus fuel economy has dropped in each year, contributing to the PHESB's superior performance over the control. There is no evident explanation for why the control bus fuel economy continues to decrease, and there is insufficient data available for Advanced Energy to make a determination of why.

Lifetime maintenance costs in terms of cost per mile traveled are shown for the PHESB and the control bus in Figure 2, below. Maintenance costs include 30-day inspections, scheduled preventative maintenance, and unscheduled repairs, but do not include diesel fuel cost.

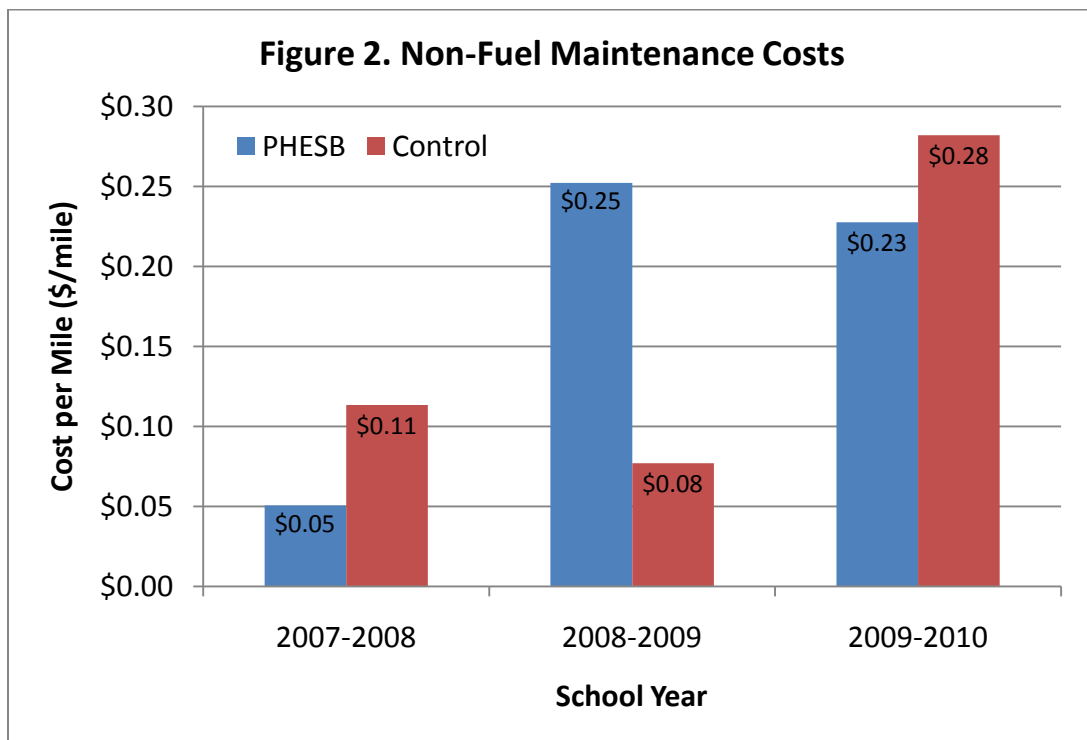


Figure 2 shows that maintenance costs for the PHESB were lower than maintenance costs for the control bus in the 2007-2008 and 2009-2010 school years, but were significantly higher in 2008-2009. This is consistent with Wake County's reports of PHESB reliability problems during that year. 2009-2010 PHESB maintenance costs were slightly lower than in the previous year, but not largely. Interestingly, the maintenance for the control bus was significantly higher in 2009-2010 than in previous years. It is unclear why this is the case. Overall, lifetime maintenance for the PHESB has been approximately 13 percent higher than for the control bus. If the PHESB can continue to function properly, as it did in the latter part of

the 2009-2010 school year, Advanced Energy would expect PHESB maintenance costs to decrease to below those of the control bus.

Advanced Energy's final project task for 2010 was to update the PHESB project website. Advanced Energy continues to receive many inquiries from the public about the PHESB project and in response to those inquiries we saw a need to increase the utility of the website. The goal of the site redesign was to make the site a better resource for those interested in the buses. This included updating the Knowledge Library section with the most recent project reports, adding a more complete project history and adding a Frequently Asked Questions section. The revised website went online in early September and can be viewed at: www.hybridschoolbus.org.