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American Fuel Cell Bus Project: First Analysis Report

Background

This report summarizes the experience and early results from the American Fuel Cell Bus (AFCB) Project, a fuel cell bus demonstration funded by the Federal Transit Administration (FTA) under the National Fuel Cell Bus Program (NFCBP). A team led by CALSTART and SunLine Transit Agency developed a next-generation fuel cell electric bus (FCEB) for demonstration. The 40-foot ElDorado National transit bus features a BAE Systems series hybrid propulsion system powered by a Ballard Power Systems fuel cell and lithium iron phosphate batteries. BAE Systems took the lead integrator role, responsible for integrating the system into the bus and making sure the final product met the performance specifications. The bus is being operated in SunLine's service area in the Coachella Valley region of Southern California. The National Renewable Energy Laboratory (NREL) has been tasked by FTA to evaluate the buses in service. This report documents the early development and implementation of the buses and summarizes the performance results through February 2013.

Objectives

The objectives of the overall research effort are to develop and demonstrate a next-generation fuel cell electric bus and to move the industry closer to commercialization of fuel cell technology for transit buses. The objective of the report is to disseminate information about the independent evaluation conducted by NREL of the subject vehicles.

Findings and Conclusions

The average fuel economy of the AFCB is 2.4 times higher than that of the CNG baseline buses. During the evaluation period, the AFCB achieved exceptional availability, averaging 85 percent.

During the evaluation period of the report—March 2012 through February 2013—the AFCB accumulated nearly 43,000 miles and more than 2,700 operating hours on the fuel cell system. Overall, the AFCB averaged 6.54 miles per kilogram of hydrogen, which equates to 7.39 miles per diesel gallon equivalent (DGE). The report compares AFCB fuel economy to that of CNG buses as a baseline. The average fuel economy of the AFCB is 2.4 times higher than that of the CNG baseline buses. During the evaluation period, the AFCB has achieved exceptional availability, averaging 85 percent. The issues causing downtime were most often related to general bus system items rather than the advanced technologies that were the focus of the demonstration. SunLine will continue to operate the bus in service and will add two more AFCBs to its fleet in 2014 funded through another FTA program.

Benefits

This report documents the progress toward commercialization of a fuel-cell-dominant FCEB that can meet the needs of U.S. transit agencies. BAE Systems based the AFCB propulsion system on its fully-commercial diesel hybrid platform, which was modified to incorporate Ballard Power System's newest fuel cell in place of the diesel engine. Using the BAE Systems commercial hybrid platform as the base for the AFCB reduced the development time and allowed the team to focus on integrating the added components.

Project Information

FTA Report No. 0047

This research project is led by CALSTART. The report was written and the evaluation conducted by the National Renewable Energy Laboratory. For more information, contact FTA Project Manager Christina Gikakis at (202) 366-2637, christina.gikakis@dot.gov. All research reports can be found at www.fta.dot.gov/research.