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A Study of the Feasibility of Utilizing Fuel Cells to Generate Power for the New Haven Rail Line conducted by the Connecticut Academy of Science and Engineering on behalf of ConnDOT

The Connecticut Academy of Science and Engineering (CASE) recently released a report entitled "A Study of the Feasibility of Utilizing Fuel Cells to Generate Power for the New Haven Rail Line." This study was mandated by the Connecticut General Assembly and conducted by CASE on behalf of the Connecticut Department of Transportation (ConnDOT). The purpose of this study was to explore using fuel cells to generate electricity for a variety of applications related to New Haven Rail Line operations. These include supplying traction power, providing electricity to the catenary system that powers the railcars; and powering maintenance yard buildings, railroad stations, and the rail line signal and control system. Although the study's focus was on the stationary power needs of the New Haven Line, the development of onboard traction power and auxiliary power for rail cars were also discussed. Readers of the October 11, 2007 *Hartford Courant* review of the report may have gotten the impression that the report is unfavorable to use of fuel cells on the New Haven Rail Line. In actuality, the CASE report focuses on several attractive applications for fuel cells.

The study examined all New Haven Line power applications to determine which, if any, would benefit most from the use of fuel cell power, and to identify any technical issues with using fuel cells for these applications. In general, fuel cell power is most economically attractive when there is the opportunity to utilize a fuel cell's electrical and thermal output (heat released in operating the fuel cell); where the fuel cell system operating in conjunction with the utility network can provide very high reliability power to serve critical safety and operational electrical requirements and redundancy in the event of a utility power outage; where new construction provides the lowest installation cost; and where state-owned space is available for system installation.

The study examined fuel cell products that have global operational experience approaching 10 million hours. Durability and reliability of stationary fuel cell power plants are at levels consistent with electricity provided by utilities from central station power plants. It was found that there are no technical issues associated with application of existing fuel cell power plants to New Haven Line applications; however, finding a productive use of heat produced from the operation of fuel cell power systems such as for heating buildings is important for improving efficiency and making fuel cells economical.

Total electricity usage by the New Haven Rail Line makes it the largest consumer of electricity of all state owned and or operated facilities/systems. Its location, much of which is in Fairfield County, makes it a candidate to remove a significant amount of power from the electric grid in one of the state's most electrically congested regions.

Our analysis indicated that fuel cell power should be considered for new rail-maintenance facilities in the New Haven Yard and in the designs for new parking garages and passenger station improvements in New Haven and Stamford.

Although the study's suggestions focused on the most attractive applications, those with the best match for power and heat to maximize fuel cell operating efficiency, the study also

suggested considering the use of fuel cells for traction power. A key consideration in deciding to use fuel cells for traction power is whether fuel cell power is economically competitive with traditional power generation. Further analysis will be needed to determine if heat generated by the fuel cell systems can be captured for use in buildings along the line and if existing premiums/incentives for environmental and power congestion relief attributes of fuel cells could be captured.

The traction power scenario provides an opportunity to reduce power losses in the catenary system between existing CL&P power supply substations. Also, if fuel cell power were installed on the New York portion of the New Haven Line, there would be a significant increase in the ability to move passengers to and from Grand Central Station in the event of a utility network power outage.

The New Haven Rail Line is the major electric power user among state-owned facilities and a critical element in Connecticut's transportation network. The study's suggestions provide a sound basis for considering the use of fuel cells for various rail line operations. These suggestions also provide a framework for considering the use of fuel cells for other state-owned buildings, which would provide additional opportunities to improve the efficiency and environmental aspects of energy use by the State.

Finally, the use of fuel cells for New Haven Line applications would provide valuable production volume and application experience for Connecticut fuel cell manufacturers, which could enhance their ability to market products to other rail systems based on their operational experience in the most extensive commuter rail complex in the United States.

The Academy and ConnDOT reported the study's findings at a Briefing on October 10, 2007 for the Commerce, Energy & Technology, Environment, and Transportation Committees of the Connecticut General Assembly

The study report is available on the Academy's website at: www.ctcase.org or http://www.ctcase.org/reports/rail_fuelcell_web.pdf.

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