Texas Commission on Environmental Quality
New Technology Research & Development (NTRD) Program
Monthly Project Status Report

Contract Number: 582-11-11145-3264

Grantee: The University of Texas at Austin (UT-CEM)

Report for the Monthly period: December 2012

Date Submitted: January 8, 2013

Section I. Accomplishments

Provide a bulleted list of project accomplishments as well as a description of their importance to the project.

- In December 2012, Gas Technology Institute (GTI) and UT-CEM operated the reformer for about 42 hours and produced 19 kilograms of hydrogen.
- Received results from the two hydrogen samples taken in October 2012. The results show that the only component tested that was not below the J2719 purity specification for hydrogen was the oxygen level. The specification for oxygen in 5 parts per million (ppm) and oxygen was measured at 7 ppm for both samples. However, nitrogen was also measured at about 20 ppm in both samples. The ratio of nitrogen to oxygen in each sample suggests that air could have been introduced during the sampling process and account for this slightly elevated oxygen level. Oxygen and nitrogen do not pose a risk to the life or degradation of the fuel cell.
- Issues reported in November 2012 regarding operation of the fuel cells on the Proterra bus were traced to improperly plumbed exhaust lines that were allowing water to build up in the fuel cell. These lines have been rerouted to correct the problem.
- On December 3, 2012, the last day of scheduled service for the Fall semester, the transmission on the bus experienced a failure limiting operation of the bus to 16 miles per hour (mph). Proterra removed the transmission and sent it back to their facilities in South Carolina for repair. The transmission will be re-installed in January 2013with the goal of having the bus ready for service at the start of the Spring semester.

Indicate which part of the Grant Activities as defined in the grant agreement, the above accomplishments are related to:

> *Task 2.5: The PERFORMING PARTY will operate the hydrogen fuel cell hybrid-electric bus in a realistic working environment over a twelve month period, including using the hydrogen generation and fueling station as the bus's primary fuel source.*

Section II: Problems/Solutions

Problem(s) Identified: Report anticipated or unanticipated problem(s) encountered and its effect on the progress of the project

a) On December 5, 2012, there was a possible power surge that temporarily caused spikes in the data that feeds the control system. The error that shut the system down was no flame detection for the shift reactor.
b) Several subsequent attempts to restart the system were unsuccessful due to lack of coolant flow in the chiller circuit.
c) Oxygen in hydrogen sample exceeded the J2719 specification level by 2 ppm.
d) The Proterra bus transmission experienced a failure on December 3, 2012.

Proposed Solution(s): Report any possible solution(s) to the problem(s) that were considered/encountered

a) Monitor the control system and determine if longer deadband time is needed before a shutdown is initiated.
b) Check the refrigeration loop on the chiller to confirm chiller operation. Install a make-up feed reservoir in coolant loop and add more glycol to cooling fluid.
c) Perform another analysis of produced hydrogen to check oxygen level
d) Proterra pulled the transmission and will repair it at their facilities.

Action(s) Conducted and Results: Describe the action(s) taken to resolve the problem(s) and its effect

a) Included additional deadband time and so far the errors have not reoccurred.
b) GTI ordered necessary parts to add reservoir tank to the chiller and scheduled a trip to Austin, Texas, for installation the first week of January 2013. Results to be determined.
c) UT-CEM will collect another hydrogen gas sample early in 2013 after the chiller reservoir is installed and the station is up and operational. Results to be determined.
d) Bus transmission will be re-installed in January 2013. Results to be determined.

Section III. Goals and Issues for Succeeding Period:

Provide a brief description of the goal(s) you hope to realize in the coming period and identify any notable challenges that can be foreseen

- Continue operating the hydrogen station and refueling the bus.
- Continue collecting data on fueling and bus operation.
- Install repaired transmission and return the bus to service.
- Before bus can return to service, new drivers for the Spring semester will need training. This training will occur after the bus transmission is installed and operational.

Date: 01/08/2013

Authorized Project Representative's Signature

NOTE: *Please attach any additional information that you feel should be a part of your report or that may be required to meet the deliverable requirements for tasks completed during this reporting period.*