

**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)

**Report for the Monthly period:** March 2013 **Date Submitted:** April 5, 2013

**Section I. Accomplishments**

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

- In March 2013, the hydrogen station reformer was operated for about 44 hours and produced 41 kilograms (kg) of hydrogen. Average refueling times have been approximately 10 to 11 minutes.
- Received and began programming the new computer for the hydrogen generation station.
- Received the power measurement equipment for the hydrogen generation station.
- Identified and ordered new check valves and solenoid valves for the priority panel in the hydrogen generation station.
- Identified and ordered a two tower desiccant dryer for the air delivered to the hydrogen generation station. The current dryer needs replacement.
- The bus ran successfully for the first week of March 2013. During the second week of March, the bus was out of service since this coincided with UT's Spring Break. During Spring Break, Capital Metro has reduced UT shuttle service.
- On Monday, March 18, 2013, the bus returned to service. That morning around 10:00 AM, the bus was pulled immediately out of service due to an electrical fire in the rear compartment. The bus was towed back to the First Transit facility on Burnet Road. No people were injured during the event.
- Proterra technicians on-site inspected the fire and found that it appeared to be an electrical short with a high voltage wire. There was significant burning of the cables in the area. Proterra decided the safest route was to return the bus to South Carolina for a more detail inspection and diagnosis.
- The bus is currently in Greenville, South Carolina, and Proterra is trouble-shooting it. The good news is that it appears the fire was not related to hydrogen on the lithium battery chemistry. The DC/DC converter appears to be in good shape, as do the batteries. The exact cause of the electrical fire is still unknown and Proterra continues to investigate.
- The bus will return to Austin to finish the demonstration as soon as Proterra is confident they have found and solved the problem.

*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 March 6, 2013, the flow control valve that supplies combustion air to the reformer burner became unresponsive.
- b) On March 6, 2013, during filling of the bus it was noticed that the air actuated valves on the low and high banks were not opening.
- c) On March 11, 2013, the hydrogen generation station shut down and displayed an "FS800" error. This error indicates lack of coolant flow from the chiller to the reformat heat exchanger.
- d) On March 18, 2013, the Proterra bus experienced an electrical fire in the rear compartment while in service.

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

- a) The flow control valves needed to be reset.
- b) UT inspected the valves and saw no physical or electrical issues. This led to suspicion of a programming/control error.
- c) Possible issues identified were: a bad pump motor, a faulty thermostat, a bad control relay, or some other issue.
- d) The bus was pulled from service and an initial inspection revealed a possible electrical short fire.

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

- a) UT personnel manually cycled and reset flow control valve FCV 111 from 0 to 100% open. The station was then put back into run mode and the valve operated properly.
- b) Gas Technology Institute (GTI) determined that the programmable logic control (PLC) code became stuck in top off mode. A bit in the code had to be manually reset. After the reset, subsequent bus fills were successful.
- c) After several troubleshooting sessions, UT personnel determined that control relays between the station's PLC and the chiller control system were damaged. UT provided and installed new relays. The station operated without this error reoccurring for about 20 hours.
- d) The bus is currently in Greenville, South Carolina, for further inspection to determine root cause of the fire. Final investigation results are expected in early-April 2013.

### **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*

- The hydrogen generation system will be operated to replenish hydrogen consumed by the bus throughout the period.
- GTI will plan a visit to the site to install the power measurement equipment, the computer, and the air dryer. GTI will also install new check valves downstream of the DM compressor on the priority panel and new solenoids on the emergency shutdown and priority fill valves.
- Proterra will finish their investigation of the fire.
- Pending successful resolution of the fire issue, Proterra will return the bus to Austin and it will go back into service for the remainder of the program.

*Date:* 04/05/2013

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*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.*