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

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| **Contract Number:** | 582-11-11145-3264 | | |
| **Grantee:** | The University of Texas at Austin (UT-CEM) | | |
| **Report for the Monthly period:** | August 2012 | **Date Submitted:** | September 10, 2012 |

## Section I. Accomplishments

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

- Performed maintenance on hydrogen station and attempted to correct natural gas booster compressor leak. Steps included:
  - Removed spent desulfurizer adsorbent and replaced with fresh material; UT-CEM disposed of hazardous material through Environmental Health and Safety Office.
  - Calibrated station and dispenser hydrogen ($H_2$) sensors.
  - Checked site flame detector.
  - Replaced air actuator on priority panel which had developed an intermittent leak.
  - Rebuilt first and second stages of the natural gas booster compressor.
  - Ordered piston rings for the natural gas booster compressor for installation in September 2012.
- The natural gas booster compressor on the hydrogen station, which feeds the reformer, continues to leak and not build pressure at the rate needed to sustain the reformer. Gas Technology Institute (GTI) has rebuilt both stages (seals and valves) and the problem still persists. New piston rings have been ordered and will be replaced the first week of September 2012. (See Section II for more information.)
- The bus continued to experience problems that prevented it from beginning passenger service. Proterra and Hydrogenics continued to work the air blower issue that arose in July 2012. The air blowers are going into unrecoverable faults due to apparent thermal related failures on the blower. (Issues are detailed in Section II.)
- Currently both fuel cells have been removed from the bus and shipped to Hydrogenics for complete testing and recertification. Expect to return and be installed on the bus the third or fourth week of September 2012.

*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) The natural gas boost compressor, which feeds fuel to the reformer, experienced a loss of performance and possible air infiltration. The compressor was unable to achieve full pressure and a rate high enough to sustain the reformer requirements for heating and hydrogen generation.
b) Proterra and Hydrogenics continued to work the fuel cell air blower thermal issues from July 2012.

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

a) The compressor has a leak and is introducing air diluted methane to the burners. GTI ordered first and second stage rebuild kits which were installed the week of August 13, 2012.
b) Timeline of activities during August 2012 by Proterra and Hydrogenics to resolve the air blower thermal problems:
    1. August 1 – Proterra technician was onsite for three days and was unable to get fuel cells operational, except by using a forced air source which was able to get the fuel cells temporarily operational. Hydrogenics was analyzing data and shipped a new blower.
    2. August 8 – Proterra and Hydrogenics call blower supplier to discuss what appears to be thermal related failures on blower. Blower supplier insists the air blowers should run well at high temperatures and not have unrecoverable failures.
    3. August 14 –Proterra thermally characterizes the fuel cell system in bus.
    4. August 17 – Conference call with Center for Transportation and the Environment (CTE), Hydrogenics, and Proterra was held. Team decision was made to send all fuel cells back to Hydrogenics for repair and recertification.
    5. August 29 – Proterra technician removes fuel cells and prepares for shipping. Fuel cells removed from bus and left inside First Transit.
    6. September 6 – UT-CEM boxes fuel cells and fuel cells ship to Hydrogenics.

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

a) Rebuilt kits did not solve the natural gas booster compressor problems. GTI ordered piston ring kits and plans to install new piston rings the first week of September 2012. Results to be determined.
b) Hydrogenics will recertify and repair the fuel cells when they arrive. Results are to be determined. Expecting to be installed on the bus during the third or fourth week of September 2012.

## 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*

- Recertify and repair Proterra bus fuel cells.
- Begin passenger service with the bus in October 2012. Additional drivers will need to be trained for the Fall semester routes.
- Continue producing hydrogen for use by the Proterra bus. Modifications to the PLC code will be implemented as confidence is gained to increase the level of automation and unattended operation time.
- GTI has scheduled a trip to Austin for the first week of September 2012 to replace the piston rings in the natural gas booster compressor. Additional maintenance activities to be performed in September 2012 include:
  - Replace check valve on priority panel (valves never arrived in August 2012).
  - Take hydrogen gas sample and analyze at GTI's facilities in DesPlaines, Illinois. (Since natural gas compressor is down, GTI was unable to take samples during August 2012.)

*Date*: 9 /10/2012

*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.*