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

Contract Number:	582-11-13472-2019		
Grantee:	Transportation Power, Inc. (TransPower)		
Report for the Monthly period:	February 9, 2013 – March 8, 2013	**Date Submitted:**	March 11, 2013

Section I. Accomplishments

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

- Additional improvements were made to our automated manual transmission (AMT), enabling three-gear shifting.
- The accessory subsystem was redesigned to address a problem that emerged during high-power testing during the preceding month, which resulted in inverter faults that interrupted operations.
- The central control module of Tractor #1 was removed and rebuilt to match the more advanced design of the central control module installed on Tractor #2.
- Miscellaneous minor improvements to the drive systems of both tractors were completed, such as designing and installing a separate box to house fifth wheel control electronics.
- Tractor #2 completed an initial series of road tests, validating all of the above design improvements. Batteries were charged and balanced in preparation for a final two weeks of testing before shipping both tractors to Texas for in-service operational demonstrations.
- Plans we made to utilize the last two weeks of TransPower testing to send one of the two tractors to the University of California (UC) in Riverside, California, for one to two days of dynamometer testing simulating yard tractor duty cycles. This testing, if it can be arranged without further delaying shipment of the tractors to Texas, will occur between March 14, 2013, and March 22, 2013.
- On March 4, 2013, TransPower was informed by the Port of Los Angeles in California that it had been selected to build two electric yard tractors similar to those built on this project, which will be demonstrated by Eagle Marine Terminals, a division of APL Terminals, at its cargo terminal at the Port of Los Angeles. Funding for this project will be provided by the California Air Resources Board.

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

- The first six of the accomplishments described above relate to *Task 2.3.1, "The PERFORMING PARTY will conduct at least 3 months of drive testing of Tractor 1 in simulated and/or actual service."*

- The first and sixth accomplishments relate specifically to *Task 2.3.1.2, "The PERFORMING PARTY will optimize the drive system to maximize energy efficiency while meeting performance requirements and maintaining driver comfort."*

- The second, third, fourth, and fifth accomplishments relate specifically to *Task 2.3.1.3, "The PERFORMING PARTY will identify problems likely to occur in operational service during durability testing of Tractor 1 and implement any changes to the electric drive system deemed necessary to assure reliable operation of the tractors once they are placed in actual field service."*

- The seventh accomplishment relates to commercialization of technologies resulting from the project, and provides further evidence that TCEQ funding for this project is beginning to have a broader impact on the industry.

Section II: Problems/Solutions

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

a) During the final stages of commissioning of Tractor #2, a serious disruption of control communications was experienced. This was a vexing problem that took nearly a week to troubleshoot and solve.

b) Miscellaneous minor problems such as failure of a pre-charge circuit on Tractor #1 created additional delays. The effects of all these various problems delayed our readiness to deliver the two tractors to Texas by an additional 2-3 weeks beyond the most recent targets.

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

a) The communications problem was initially thought to be the result of poor grounding or some other type of hardware problem, but after many hours of troubleshooting, the issue was eventually traced to a software bug in the Motohawk/Matlab software used to develop vehicle controls.

b) Continuous troubleshooting and repair work was required to address the various other problems that occurred during the period.

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

a) The software bug was eventually resolved by reverting to a previous version of our control software that did not contain the bug and by performing a communications test of each new revision to the control software before loading it onto the vehicle. We are still unsure why the control software becomes corrupted in this manner at random times during development, but as long as revisions can be validated as being free of this bug before flashing to the vehicle control system, it will have a relatively minor impact on future development and no impact on vehicles as long as each software revision is properly validated before being loaded onto the vehicle controllers.

b) The various small problems that occurred during the final stages of commissioning required replacement of a few parts and are not considered unusual for a project of this complexity. As of the preparation of this report, Tractor #2 is fully functional and Tractor #1 is within a day or two of resuming drive testing with its upgraded central control module and other smaller fixes.

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

Goals for the next reporting period (ending March 8, 2013) include:

- Complete two weeks of durability testing of Tractor #2 and at least an additional two to three days of re-testing of Tractor #1 with its various upgrades.
- Complete one to three days of dynamometer testing of one of the tractors at UC Riverside prior to their shipment to HEB, if this facility and support personnel are made available in time at no cost to the project.
- Deliver both tractors to HEB.
- Begin training HEB personnel in operation and maintenance of the tractors.
- Achieve at least one week of unsupervised operation of the two tractors by HEB personnel.

The main remaining challenge, now that both tractors have shown basic operating capability, is to begin extending the mean time between failures of the tractors to levels considered acceptable by commercial tractor operators such as HEB. It is hoped that this process will be expedited by the additional time spent performing durability testing and all the drive system improvements made by TransPower during this process.

Date: 3/11/2013

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.*