

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

Contract Number: 58211111463264

Grantee: Capacity of Texas, Inc.

Report for the Monthly period: September 2011 **Date Submitted:** 10/15/11

Section I. Accomplishments

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

- Due to heavy involvement by the Capacity Engineering team on a multitude of large customer orders, work completed on the Zero Emission Terminal Tractor (ZETT) project consisted of developing a decision matrix for the Lithium Ion battery pack to be used on the ZETT vehicle.
- The ZETT is designed to be a charge sustaining vehicle with the batteries being operated at 60-70% state of charge. This allows for adequate margin to recover maximum braking energy and to provide peak acceleration requirements. In Figure 1, four proposed battery packs can be seen:

Table 1: Comparison of four proposed battery pack candidates

Battery	Gaia 3.2V/18Ahr	Gaia 3.6V/45Ahr	LG Chem 3.75V/15Ahr	A123 3.3V/60Ahr
Total Energy (kWhr)	5.8	18	5	22.8
Usable Energy at 20-90% Charge (kilowatt-hours)	4.0	12.6	3.2	16.0
Peak Power (kilowatts)	120	300	60	204
Pack Configuration	1P100S	1P95S	1P96S	3P119S
Mass (kilograms)	138	200	90	288
Nominal Voltage (Volts)	320	342	360	393
Maximum Voltage (Volts)	380	400	410	428
Minimum Voltage (Volts)	250	285	260	298
Peak 1 Discharge (Amps)	1000	1500	200	612
Peak 1 Charge (Amps)	270	270	150	300

- Capacity engineering is in the process of gathering solid model data for the proposed battery packs as well as factoring the cost of the packs above before moving forward with a design decision. After the models are received, battery packaging on the ZETT chassis will begin.

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

Under Task 2, ZETT design, work continues on task 2.2.1. in the form of solid model design and determination of packaging constraints for battery packs, fuel cells, and hydrogen storage tanks.

Section II: Problems/Solutions

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

- a) Due to limited work on the ZETT project this month, few problems have been encountered. Models have been obtained for the LG Chem battery option, but are still needed for the remaining pack options. Solid models are needed to determine packaging constraints and narrow down the decision based on available space on the vehicle and battery pack pricing. Quotes for the various packs must be obtained to determine the most fiscally relevant option while meeting all performance requirements.

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

- a) None.

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

- a) None.

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 goals for the next month include the following:

- Finalize the solid model of the base vehicle.
- Determine the space available for on-board hydrogen storage and batteries.
- Continue to finalize the selection of hydrogen fuel storage tanks.

Date: 10/15/11

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.*