

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

Contract Number: 582-11-12630-3264
Grantee: EcoPower Hybrid Systems
Report for the _____ **Date** _____
Monthly period: February 2012 **Submitted:** March 9, 2012

Section I. Accomplishments

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

- Richard Laliberte and Martin Burns went to China to visit cells manufacturers. Four manufacturers were audited to verify if the manufacturing process was in control and repeatable.
- Paul-André Lavoie worked with ECS team from February 9, 2012, to February 24, 2012, and returned to ECS in California on February 29, 2012, to participate to completion of phase of the project.

Cell Testing

- Power testing was problematic with the bigger cells. The high current created important voltage drop forcing the system in protection mode.
- We have modified circuit and improve voltage measurements. The last power testing will be re-done on 42Ah and 16Ah cells early March 2012.
- 95% of the work is currently completed.

Module fabrication

- All modules are assembled and functional.
- The module fabricated with 26650 cells using the soft material as bus bars are working. The development work done is successful. They are going in cycling early March 2012.
- The second 26650 cells will not be assembled in module considering lack of manufacturing control seen during visit at production facility.

Module testing

- Cycling protocol is completed and approved.
- We used the delay associated with module fabrication to push little further the battery management system (BMS) configuration to be used. Preliminary BMS set-up required to test three or four 4 X 3.2V modules independently to demonstrate capability to complete Crane duty cycle and check for data consistency. We have advanced BMS configuration to allow 4 X 4 X 3.2V; this allows cycling the four modules connected in serial configuration at 51.2V with the same reading accuracy than with the four independent modules cycling.
- The full power capacity of the cyler is required to achieve this forcing each module configurations to be cycled one after each other respectively. The total capacity of each pack of 4 modules assembled was: 4.3, 4.8, and 5.1 kilowatt-hours.

- To achieve the 51.2V configuration, the test fixtures, the voltage and sense wire harnesses were developed and built with high voltage fuses protection.
- Cycler code instruction were completed for scaled crane duty cycle and a second high power profile used to push very cells to their capability limit
- Using developed BMS and the new voltage measurement circuit, the modules built from larger cells were cycled. They are able to deliver scaled duty cycle of the crane. This is a very important confirmation: bigger cells could be used. In a big pack, using bigger cells drastically reduces the number of connections required; one 42 Ah cells replace fifteen cells of 2.8Ah that would need to be connected in parallel. To give the order of magnitude at pack level, it represents less than 900 connections versus 13400 connections for smaller cells. It was important to demonstrate that heat generation could be controlled with bigger cells.
- The final cell to be used is not determined yet and with all lessons learned, we could review our original cell choice for the final pack. But we are pleased to be able to demonstrate that the safer lithium iron phosphate technology can meet the targeted specifications.

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

All these realizations are related to the phase one of the project.

Section II: Problems/Solutions

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

- All technical issues are fixed now. We expect testing to be fully completed by March 16, 2012.
- The main challenge will be time frame to analyze final sets of data and to report.

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

- A draft of the phase 1 report will be presented at the end of March 2012.
- As mentioned last month, we propose that TCEQ could accept a draft of the report as base for the go-no-go decision. This report will demonstrate that cells and built testing modules are able to achieve crane duty cycle as this is the ultimate goal of this exercise. A final version of the report will follow when ready and completed. This will give opportunity to complete and validate some results required for the design and engineering phase.
- Testing of the commercial module proposed as fall back plan is completed. The manufacturer have demonstrated that its proposed solution be functional using high power cell can be functional using much less energy storage but very expensive.

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

- We are asking to submit a draft version of final reporting of phase one at the end of March.
- We are asking this draft document demonstrating the technical feasibility to be used as base to authorize project continuation. This approach will permit to hire supplementary resources to support development pace and to procure necessary material for the next phase of this exciting project.

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

- Cell testing: To complete all testing at cell level (95% completed; we are now performing validation and some re-runs).
Module testing: To complete testing for the third module (already in test)

Date: March 9, 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.*