Testing results

Two different cell constructions are currently being investigated for the LFP/Graphite system. These cells have undergone continuous cycling until the target of 1000 cycles was reached. The effects of this cycling on the capacity fade of the cells can be observed in Figure 1.

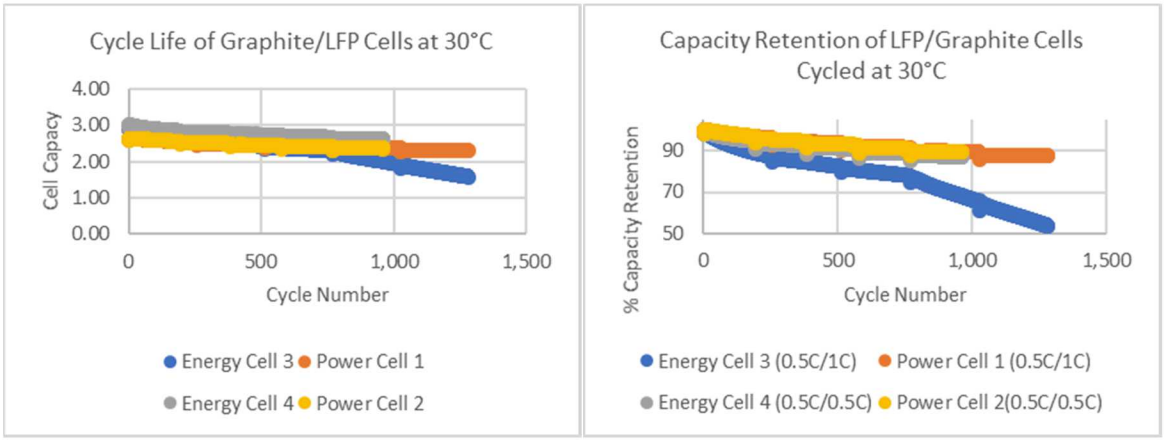

Figure 1. LFP/Graphite Cycling results

Results show that on average the power cells have lost ~10% while the energy cells have lost close to ~50% in the worst case. It is difficult to say of the ~50% loss in the energy cell is representative without additional cells to provide statistics. If we target a 50% capacity retained at end of life after 10,000 cycles the capacity fade rate would need to be .005% capacity fade/cycle. This data suggests that the capacity fade rate of this chemistry in this form factor exceed the desired decay rate by factors of ~2-5, indicating that these cells should not meet our lifetime targets. Differences in the state of health testing of these cells can also be observed as demonstrated in Figure 2.

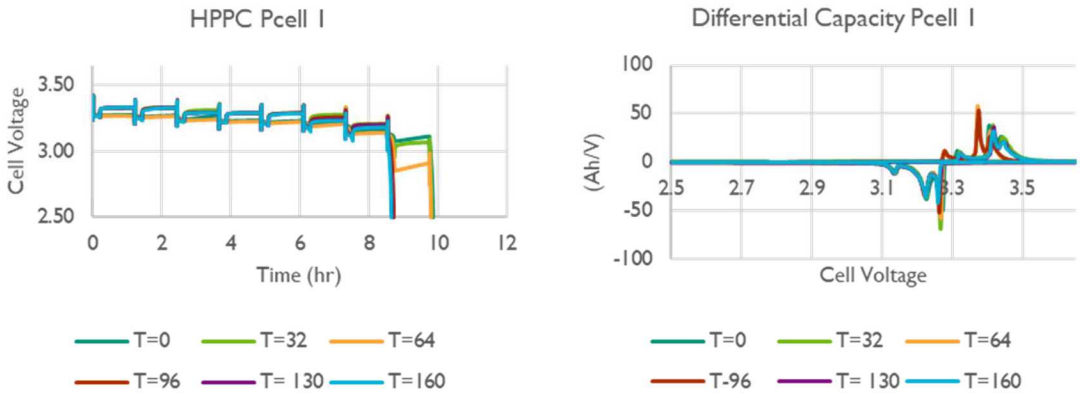

Figure 2: Power Cell 1State of Health Testing of LFP/Graphite Cells

HPPC results show that as the cell continues to cycle, it loses its ability to deliver power at low states of charge. Understanding this phenomenon will be critical for predicting end of life behavior of these cells. The differential capacity results suggest that the loss of performance is

most likely attributed to changes in the graphite anode. This is a known problem. Graphite is known to degrade from extensive cycling. As work continues on electrolyte and electrode work these hurdles may be overcome.

Development of Testing Protocol REV 2

The initial testing protocols developed and reported on were designed to test the fundamental limits of the available commercial chemistries, and to better understand the aging mechanisms present in these chemistries. With a good understanding of the limitations of the available chemistries, a new series of testing protocols are being developed to mimic potential use cases of a BTMS application. For these test protocols the "gas station" model was considered in which the BTMS system would supply the energy needed to charge EV without assistance from the grid and be charged by the grid during off-peak hours. This model has currently being refined to incorporate different loads and rate structures.

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