Our team has been researching on the SRP funded project, “Reliability and Performance of Batteries in Hot-Dry Climate” for the past two plus years with charge/discharge cycling and electrochemical impedance spectroscopy to evaluate the performance and reliability of different batteries at various operating conditions. We have examined sealed lead acid batteries (SLA) extensively at various temperatures including that at 55 °C and the results were encouraging to move to the next phase. In a typical operating condition the capacity of the SLA batteries decreases gradually with cycling due to irreversibility in the positive electrodes. Towards the end of service life, the rate of capacity fading generally accelerates significantly. This rate of health deterioration varies on the environmental and operational conditions such as temperature, float-charge voltage, and cyclic usage. As expected, the internal impedance starts to rise at a rate consistent with the capacity fading rate. The State of Health (SoH) of individual cells or batteries can be monitored by continuously monitoring their impedance, which enables prediction of the end of service life and allows the preparation of replacements for failing cells or batteries, as shown in the schematic above.

Currently, we are evaluating a new and used 6V, 100 Ah SLA batteries (see the photograph) provided by SRP with a major focus on developing a prototype SoH Watcher (Bat-Z Meter in the picture) based on the high frequency values at different charge/discharge cycle numbers. The tool will be used for field demonstration to monitor SoH and diagnose SLA batteries. The proposed concept has great potential value to SRP in terms of reducing battery system downtime.