



The 2024 IERE-SwRI San Antonio Energy Transition Workshop
May 13–16, 2024

Energy Storage for Electric Grid - A Review of the SwRI/IERE JIP

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Keywords: *Battery energy storage system (BESS), battery degradation, battery safety, battery testing and modeling*

Abstract

Grid modernization has become a new refrain in the electric utility industry. The electric grid is aging, and its modernization is imperative. One of the unique challenges of the electric grid is the need to constantly match supply to demand lest the grid become unstable. A large portion of the electric supply is relatively fixed over a short duration. The demand, however, can fluctuate unpredictably. Battery storage, as a multi-time-scale source and energy sink, is beginning to revolutionize electric distribution. Value-stacking – using battery energy storage for a variety of grid services – is becoming popular. Services such as solar shifting, arbitrage, frequency regulations, voltage support, etc., subject the battery to large swings in state-of-charge (nearly full to nearly empty), power levels, and event duration (seconds to hours). However, longevity and safety of batteries under such mixed operation is unclear, which was the subject of this joint industry project (JIP). Performance degradation and safety of batteries under mixed grid duty are important considerations from life-cycle cost and societal perspectives.

The JIP conducted by the Southwest Research Institute had five members, which included utilities and research organizations around the world.

This presentation provides an overview of the four main accomplishments of the JIP – (1) statistical characterization of field data, (2) development of an extended single particle model with temperature (SPMeT) of a lithium-ion cell, (3) development of an in-situ test to adjust parameters of this model, (4) implementation and demonstration on the research BESS at SwRI.

Note: This document will be opened to the participants on IERE website before the Workshop and opened to the public afterward.