



## THE BATTERY ABUSE TESTING LABORATORY

*The Battery Abuse Testing Laboratory (BATLab) at Sandia is an internationally recognized leader in energy storage system safety research, and is committed to serving the energy storage community and the national interest with cutting-edge research programs, the highest quality testing results, and leadership in battery safety and reliability.*

### ENERGY STORAGE SYSTEM SAFETY RESEARCH

The Battery Abuse Testing Laboratory (BATLab) at Sandia is an internationally recognized leader in energy storage system safety research. For more than 20 years, the BATLab has supported the U.S. Department of Energy (DOE), including EERE Vehicle Technologies Programs, Office of Electricity Energy Storage Research, and NNSA to understand the safety performance of advanced batteries and their impact on the technologies they enable. The BATLab also continues to support Department of Defense, Department of Transportation and private industry customers.

BATLab research and development (R&D) programs focus on:

- Understanding the fundamental mechanisms that lead to energy storage system safety and reliability incidents
- Developing new materials to improve overall energy storage system safety and abuse tolerance
- Performing abuse testing
- Advancing testing techniques
- Performing detailed failure analyses
- Developing strategies to mitigate energy storage cell and system failures



### ABUSE TESTING

In order to ensure the safety and reliability, of battery systems, components must be stressed to extremes to determine when and how they will fail. Only when a manufacturer knows a battery's full performance envelope and its failure modes can it market a product with assured safety and reliability.

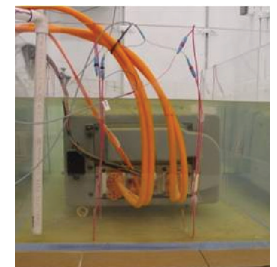
Sandia's BATLab provides comprehensive safety and reliability testing of capacitors, cells, batteries, and systems from milliwatt-hours to kilowatt-hours. Our capabilities include mechanical abuse, electrical abuse, and thermal abuse.

The BATLab is equipped with four mechanical abuse test systems to perform a variety of puncture, impact, or crush tests that can deliver up to 120,000 pounds of applied load, 24 channels of electrical test equipment up to 600 V and 200 A, and a variety of thermal enclosures and fixtures to abuse-test different cell formats, modules, and battery packs.

BATLab test-development activities include component testing for internal short circuits, battery separators, electrolyte flammability, failure propagation, and system-level abuse testing.

### COMMERCIALIZATION PATH

The BATLab has had a number of partnerships over the years including cooperative research and development agreements (CRADA) and strategic partnership programs (SPP) with industry and government agencies to study battery safety and reliability. Our past and current partners include: GM, Ford, and Chrysler through our affiliation with the USABC, NASA, Nissan Motors, SK Corp., Hitachi, Enerdel, Quallion, Eaton Corp., Air Products, Exxon/Tonen, Dow Chemical, Solvay, University of Rhode Island, SEEO Corporation, BASF Corporation, and Teledyne, Department of Transportation and Albemarle.



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