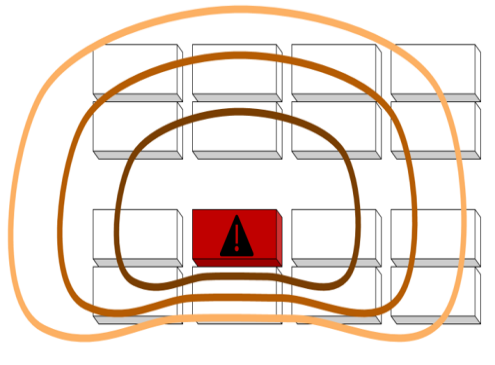
Supplemental Project Notice

BATTERY ENERGY STORAGE FIRE PREVENTION AND MITIGATION PHASE III



PROJECT HIGHLIGHTS

- Quantify fire, explosion, and emissions hazards created by energy storage thermal runaway.
- Guidance for safe storage system procurement by sharing data and lessons-learned.
- Insight on public health and environmental impacts of event mitigation options.
- Thorough investigation and comparison of performance from specific safety system design solutions.
- Guidance on siting risks near critical infrastructure.

Background, Objectives, and New Learnings

As energy storage costs decline and renewable energy deployments increase, the importance of energy storage to the electric power enterprise continues to grow. The unique drivers of lithium-ion battery development, including pressures of safe operation and integration into electric vehicles, consumer electronics, and scaled manufacturing, have helped ensure it remains the dominant technology for stationary storage applications. Current lithium-ion products pose safety hazards related to their chemical make-up and thermal runaway potential. However, these hazards are not unique. Whenever energy is stored it may be released in an unintended manner—presenting risk if not prevented or mitigated.

The rapid development of lithium-ion technology means that its performance is constantly changing—meanwhile, codes and standards are reacting to these new options at a different pace. As a result, leading practices have been sparse, if available at all. Interest in storage safety considerations is substantially increasing, yet newer system designs can be quite different than prior versions in terms of risk mitigation.

Utilities are uniquely positioned to impact energy storage safety practices, especially in the absence of clear risk mitigation guidelines. Effective solutions will require additional data to characterize technologies, integration practices, failure incidents and their impacts, as well as controlled testing and modeling to frame future solutions.

EPRI's research during Phase I consolidated the experience of 15 utility members, 15 non-utility experts, and 10 energy storage site evaluations to identify gaps in safe design and operations of today's ESS. Phase 2 created a lifecycle safety toolkit, including a retrofit guide, a codes and standards review, emergency response plan guidelines, and more. Moving forward, EPRI will use prior learnings and a new safety roadmap activity to prioritize and further extend the toolkit resources. Industry insights will be incorporated to guide utility owners, operators, and off-takers in their design, procurement, planning, and incident response.

Benefits

This project is expected to directly inform battery energy storage system (BESS) siting, community risk assessment, failure event impacts, and emergency response procedures. Items required by codes and standards, and leading practices, will be investigated. Guidance for safe ESS specifications based on impact studies, model development, and test and site evaluations are planned to support quantitative assessment of specific solutions and mitigation strategies.

EPRI aims to provide utilities guidance and tools to support the safety and availability of critical grid resources when procuring assets and services—operating energy storage cost-effectively with occupational and public safety and environmental responsibility in mind.

Project Approach and Summary

This project will synthesize and generate guidance by extending the *Energy Storage Project Lifecycle Safety Toolkit* resource suite created during the Phase I and II supplemental projects. Phase III will begin with a safety roadmap (3002021077) update to incorporate recent insights gained from EPRI and the broader community. The extended toolkit will be accessible to all collaborators and include:

- Safe BESS operational guidelines
- Community and first responder outreach and training materials
- Incident recovery best practices
- Augmented reality O&M tools
- Burn testing for thermal runaway characterization, explosion risk, emissions, and effluent composition
- Safety protocols for flashover avoidance
- Environmental and public health assessments
- Residential/customer-site storage safety
- Electric Vehicle (EV) and EV charging system safety

Host participants also may select from optional site assessments to address issues with their own ESS, such as:

1. Site hazard evaluations
2. Site safety design cost tradeoff studies
3. Site Emergency Response Plan
4. Site safety retrofit case studies
5. Site environmental and public health fire impact assessment (e.g., air and water)
6. Site-specific augmented reality tools for safe maintenance and operation

Deliverables

Collaborators will receive the following deliverables:

- Detailed technical reports documenting tool development, guidance, and training materials.
- Quarterly energy storage fire safety webinars convening participants, test experts, vendors, and others to present findings, engage in Q&A, and advise on near-term research needs.
- Site hosts receive all collaborator deliverables plus results for each site-specific scope selected.

Non-proprietary results will be incorporated into EPRI's Energy Storage and Distributed Generation program P94, and provided to the public for purchase or otherwise.

Price of Project

Collaborators: $60,000. Hosts: $100,000+ (scope dependent). Contact EPRI for tailored scope options. This project qualifies for self-directed funding (SDF). Funding may be spread over three calendar years.

Project Status and Schedule

The project is expected to begin in Q2 2024 upon the participation of one funder and continue for 24 months.

Who Should Join

Utilities and system owners or operators with energy storage safety responsibilities should join this project.

Contact Information

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com).

Technical Contacts

Lakshmi Srinivasan at 202.510.7387 (lsrinivasan@epri.com)
Stephanie Shaw at 650.855.2353 (sshaw@epri.com)

Member Support Contacts

Barry Batson at 704.905.2787 (bbatson@epri.com)
Brian Dupin at 650.906.2936 (bdupin@epri.com)
Annie Haas at 704.608.6314 (ahaas@epri.com)
Chuck Wentzel at 650.855.8527 (cwentzel@epri.com)
Warren Frost at 403.474.4432 (wfrost@epri.com)

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EPRI
3420 Hillview Avenue, Palo Alto, California 94304-1338 USA • 800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com