Battery Energy Storage Systems:
Main Considerations for Safe Installation and Incident Response

Battery Energy Storage Systems Overview

Battery energy storage systems (BESS) stabilize the electrical grid, ensuring a steady flow of power to homes and businesses regardless of fluctuations from varied energy sources or other disruptions. However, fires at some BESS installations have caused concern in communities considering BESS as a method to support their grids. BESS fires pose challenges to first responders due to the:

- Difficulty in putting out lithium-ion battery fires.
- Potential health impacts from emissions.
- Need to clean up and properly dispose of burned or impacted batteries.

Communities should consult BESS safety experts when considering and designing installations. Communities should also note that despite some high-profile incidents, improvements in BESS quality and design have led to a decrease in the number of failure incidents per gigawatt hour deployed (Figure 1).

This document includes information from first responder and industry guidance as well as:

- Background information on BESS, including challenges and recent fires
- BESS installation considerations
- BESS incident response considerations
- Resources for fire planning and response
- Standards and links to additional resources

In recent years, first responder and industry associations have developed guidance to help communities identify focus areas when planning a BESS, including how to work with local responders to improve incident preparedness. This document is a non-comprehensive collection of existing research and guidance.

Facts about Recent Fires

Since 2020, BESS failure incidents have decreased, but some recent fires have gained attention in the media. On May 15, 2024, Gateway Energy Storage Facility in San Diego, California, experienced a BESS fire with continued flare-ups for seven days following the fire. The facility held about 15,000 nickel manganese cobalt lithium-ion batteries. Following the incident, EPA has required the Gateway facility to conduct extensive environmental monitoring during battery handling and disposal operations and submit detailed work plans and progress reports.[1]

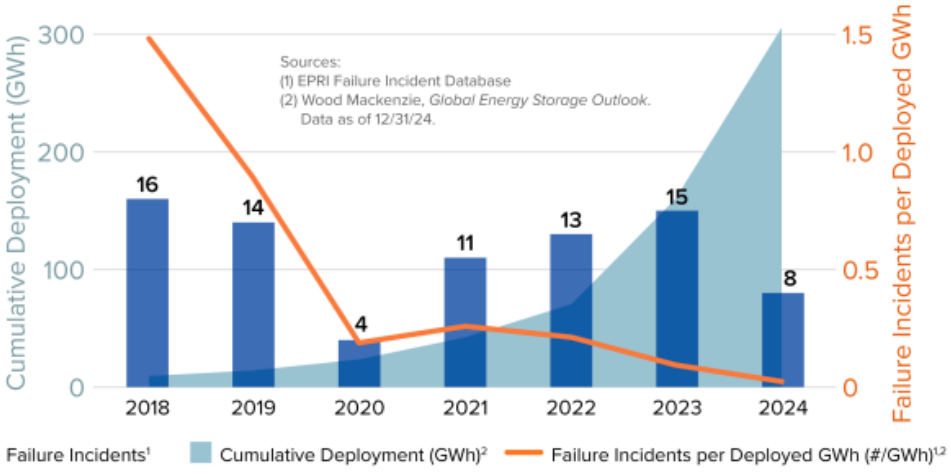

Figure 1. Global grid-scale storage deployment and failure statistics. Source: Electric Power Research Institute (EPRI), 2024.

[1] U.S. Environmental Protection Agency. (n.d.). *Site profile: Gateway Energy Camino lithium-ion battery fire*. https://response.epa.gov/site/site_profile.aspx?site_id=16485.

On January 16, 2025, a BESS fire broke out at the Moss Landing site in Monterey County, California, resulting in a 24-hour evacuation of about 1,200 residents. A joint effort among company personnel and the North County Fire Department kept the fire contained to one building, though with one notable flare-up. Air quality monitoring and sampling occurred during and after the fire and found no risks to public health. Following the incident, EPA continues to work with other regulators to ensure the safe storage, handling, and transportation of undamaged batteries remaining at the Moss Landing site.[2]

Clear and comprehensive incident response plans are critical when managing BESS sites to ensure preparedness in the event of a battery fire.

Installation Considerations

Proactive safety measures can be included in a BESS site design to minimize the risk of a BESS fire. Consider the following before installing a BESS:

- Comply with state and local siting, zoning, marking, and permitting requirements to ensure site suitability.
- Consider the design of BESS units (battery chemistry, manufacturing quality assurance/quality checks, unit design, battery management system analytic capabilities, and system integration) and consult the most recent industry safety standards.
- Include remote sensors and monitoring (e.g., infrared, thermal, fire detection).
- Communicate with local first responders to develop emergency response plans for incidents.

Incident Response Considerations

Consider the following when developing an incident response plan for BESS:

- Ensure use of Personal Protective Equipment (PPE) including self-contained breathing apparatuses to protect against hazardous air emissions.
- Set an isolation zone for large commercial BESS that is at least 330 feet, depending on the site.
- Position responders upwind and uphill.
- Evaluate the need for community shelter-in-place or evacuation, depending on the incident and site.
- Current guidance is to focus the response on preventing the spread of fire.
    - Direct fire crews to let the fire burn itself out and to use water to prevent the spread of fire to neighboring batteries or other structures.[3]
- Assess hazardous air emissions:
    - Use modeling to guide on-site decision making and initially monitor for hydrogen, carbon monoxide, hydrogen fluoride, hydrogen cyanide, and hydrogen chloride.
    - As an incident extends, sample air for metals and other combustion byproducts of burning plastics.
- Minimize, contain, and/or redirect runoff from water application, to the extent possible.
- Package contents safely for transport and disposal after the event, considering Department of Transportation and EPA requirements.

[2] Vistra. (n.d.). *Moss Landing response*. Moss Landing Response. https://www.mosslandingresponse.com.

[3] Research is ongoing into the most effective method of water application to prevent spread.

Resources for Fire Planning and Response at BESS Installations

In addition to adhering to existing standards, communities and operators of BESS sites should reference existing resources to enhance fire preparedness and response plans. Table 1 includes a list of trainings, standard operating procedure (SOP) guides, toolkits, emergency response plans, and research for BESS sites.

Relevant BESS Standards

National Fire Protection Association (NFPA) Standard 855: Standards detailing the requirements for mitigating the hazards associated with energy storage systems (ESS). First edition 2020; current edition 2023; next update 2026.

Underwriters Laboratory (UL) 9540 and 9540A: Standards for energy storage systems and equipment: charging and discharging procedures, fire protection, and test methods for BESS. First edition 2016, current edition revised 2025.

Table 1. Additional resources for BESS sites

Resource (Linked)	Description
EPA On-Scene Coordinator Lithium-Ion Battery Outreach Page	• **Outreach**: The EPA On-Scene Coordinators are available to provide training to city and county fire fighters, Local Emergency Planning Committees (LEPCs), and conference audiences. Contact information is available on the Outreach page. • **Resources:** Resources for pre-planning with local responders, sample standard operating procedures, presentations, and worksheets. • **Web-based**: Remote training that covers battery basics, hazards, transport and disposal concerns, and air monitoring (coming soon).
NFPA ESS Safety Fact Sheet	• Fact sheet outlining ESS advantages, hazards, and safety measures.
San Diego Fire Department Toolkit	• Collection of resources on lithium-ion battery fire response, incident reports, research, and public safety education.
Tennessee Emergency Management Agency (TEMA) Toolkit	• Collection of fact sheets and presentations on BESS fire hazards and prevention.
International Association of Fire Chief (IAFC) Fact Sheet	• Fact sheet covering recommended fire department ESS pre-planning and incident response.
Electric Power Research Institute (EPRI) Research Hub	• Collection of energy storage research, including information about EPRI's database of BESS failures and root cause categorizations.
Fire Protection Research Foundation Website	• Information about an ongoing research project examining hazards and mitigation for BESS units.
New York Battery and Energy Storage Technology Consortium Library	• Library of systems safety and best practices resources from various associations and fire codes.