

Battery Energy Storage: Blueprint for Safety

A Framework for Action

The battery energy storage industry has developed a comprehensive and proactive approach to ensuring safety across the United States. This Blueprint for Safety provides a comprehensive framework that presents actionable and proven solutions for advancing safety at the national, state, and local level. The energy storage industry is committed to acting swiftly, in partnership with fire departments, safety experts, policymakers, and regulators to enact these recommendations.



Photo credit: Tesla

Soldotna, Alaska: Homer Electric installed 46 MW Tesla Megapack system to increase energy capacity along Alaska's rural Kenai Peninsula, providing support to gas turbines and helping to prevent outages.

Battery Energy Storage is the Swiss Army Knife of the Power Grid

The assessment, conducted by the Fire and Risk Alliance, studied historical data and scientific assessments of fire incidents over the previous decade at BESS facilities in the United States. **The assessment's main finding shows that in all reviewed cases of environmental sampling related to the BESS fire events, no previous incidents resulted in contaminant concentrations that would pose a public health concern or necessitate further remediation.**

As the investigation into the fire at the Moss Landing facility, increasingly viewed as an anomaly and a system located in a 1950's gas turbine hall, is ongoing, the assessment underscores the importance of modern designs and recently published standards: Many documented BESS fires involved early-generation systems that predate modern safety standards. The implementation of robust national codes and advancements in ESS design have significantly improved fire safety and reduced risks.



Photo credit: Fluence

Blueprint for Safety:

Tested, Vetted, & Certified Batteries & Equipment

Battery energy storage technologies are designed to meet and exceed qualification standards. These systems are tested and vetted, certified, and ultimately built to comply with the nation's leading safety standard. **The U.S. battery energy storage industry uses a suite of important certifications and standards that guide the safe design, installation, and operation** of battery energy storage facilities. These documents are regularly updated based on the advice, applied lessons, and research from leading safety experts, fire professionals, fire protection engineers, and scientists. These standards help ensure that battery energy storage facilities are able to perform the role perform their roles as designed, ensuring the electric grid is stable, affordable, and reliable for American communities and businesses.

Certified Batteries

UL 1973 and UL 9540 are critical safety standards that ensure battery energy storage systems operate reliably and securely. UL 1973 certifies the safety and performance of battery cells, modules, and packs, evaluating their ability to withstand thermal runaway, mechanical stress, and electrical faults.

Proven Battery Packs & Systems

The UL 9540 certification builds on this by evaluating the entire battery energy storage system, verifying that it meets rigorous fire, electrical, and functional safety requirements. Together, these standards provide a robust framework that minimizes risks, protects facilities and communities, and instills confidence in the safety of battery energy storage technology.



Battery energy storage systems under UL 9540A undergo thorough testing to ensure that, in the rare case of a fire, the fire will be contained within a single unit located within the secure facility site. These **large-scale fire tests** ensure battery enclosures are designed and installed so that any incidents that do happen are contained and don't spread to other units.

Photo credit: Powin

The UL 9540A test evaluates thermal runaway propagation risks in battery energy storage systems by assessing how battery cells, modules, and packs react to overheating, mechanical damage, or electrical abuse. Conducted at the cell, module, unit, and system levels, this test helps determine fire safety and supports implementation of effective mitigation strategies.

At the unit level, systems include a variety of advanced safety features designed to mitigate and eliminate hazards.

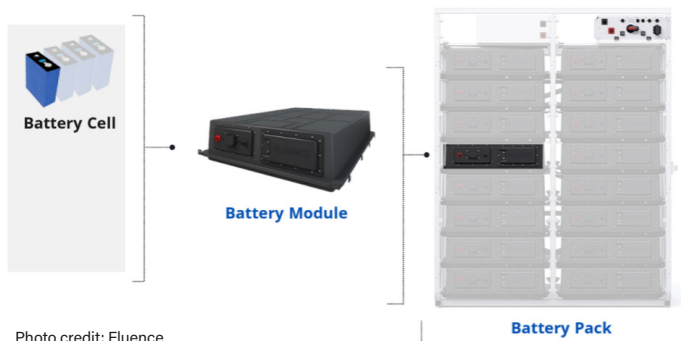
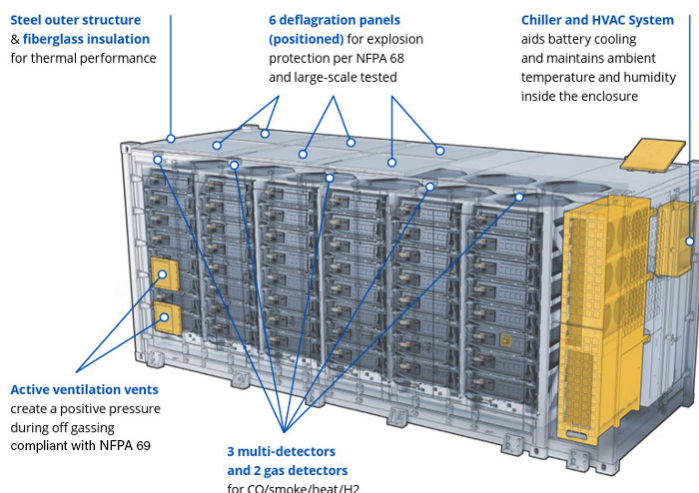


Photo credit: Fluence



“Regulators and policymakers should be aware of required codes and standards, because those must be incorporated into local regulations. NFPA 855 requires all battery energy storage systems be listed to UL 9540, a standard that incorporates the entire system: the enclosure, the communications, the HVAC...a whole systems approach.”

Kara Gerczynski, Division Chief, Fire Prevention and Administration, The Elizabeth (CO) Fire Protection District

Blueprint for Safety: Battery Energy Storage Projects are Built to Exceed the Most Rigorous Safety Standards

As the premier national standard for battery energy storage safety, NFPA 855 guides the collaboration between the battery energy storage industry and firefighters to maximize the safe and reliable performance of battery energy storage as critical grid infrastructure. **NFPA 855 provides mandatory requirements** for the design, installation, commissioning, operation, maintenance, and decommissioning of battery energy storage facilities, distinguished by battery energy storage technology



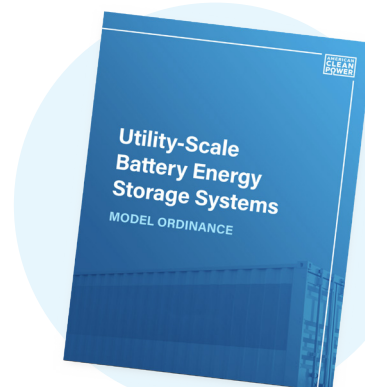
In addition to requiring tested and certified batteries and equipment, NFPA 855 includes standards for metrics such as maximum energy and spacing between units and lists several submittals that must be made to the regulating governmental entity, including a hazard mitigation analysis (HMA), an emergency response plan (ERP), and details of all the safety features in the system.

Plus Power's Kapolei Energy Storage Facility on Oahu, Hawai'i

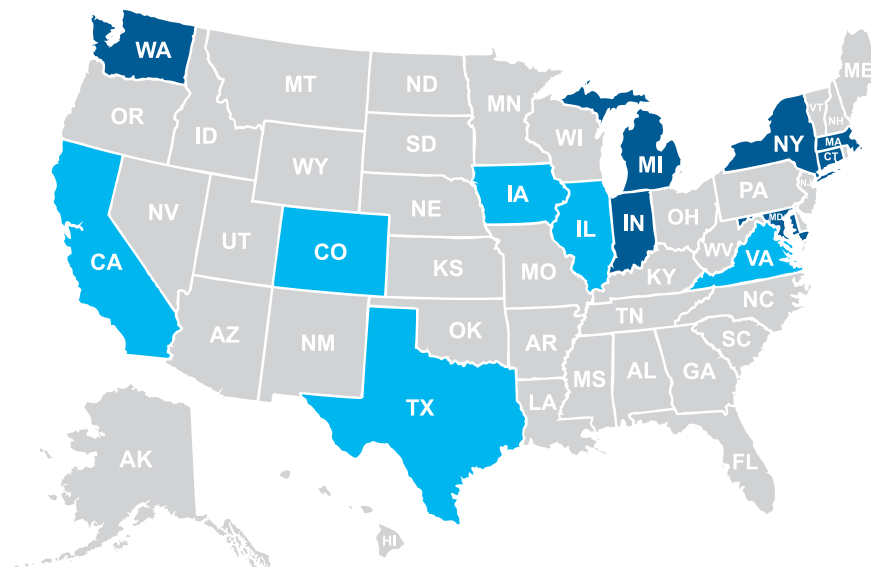
Photo credit: Plus Power

Industry is Advancing Safety Standards Across the United States

The battery energy storage industry advocates for the adoption and enforcement of the latest and most rigorous safety standards. The industry has worked to **incorporate NFPA 855 as a requirement for permitting battery energy storage projects in states** like Indiana and Maryland — and continues to advocate for the latest safety standards in states like California, Texas, Illinois, and Virginia. Uniform adoption of the nation's most rigorous safety standards across jurisdictions ensures that across the United States, regardless of the community or the state, the most vetted and trusted safety strategies, designs, and equipment are used to guide battery energy storage deployment. To support state and local governments, the battery energy storage industry has developed an **NFPA 855-centered model ordinance** that can serve as the basis for new or updated permitting rules.



The battery energy storage industry has worked in partnership with fire officials and state governments to adopt NFPA 855, ensuring all battery energy storage facilities are held to the highest standards. The industry continues to work with state policymakers across the country to update safety rules, including mandatory initial and annual refresher training for first responders.



- Adopted NFPA 855 Provisions
- Pending Safety Policy Changes

Blueprint for Safety:

A Comprehensive 3-Part Strategy

The battery energy storage industry is committed to working with state and local agencies to address concerns raised by the Moss Landing incident and promote safety at all battery energy storage system facilities. The scale and impact of the Moss Landing incident was an anomaly, and there are proven solutions to ensure that this type of event remains an anomaly.

In addition to supporting the speedy implementation of the latest edition of NFPA 855, the industry supports conducting reviews and taking corrective action to promote safety at storage facilities that were built prior to the first publication of NFPA 855 in 2019. Policy makers will have an important role to play in helping to ensure batteries continue to be deployed responsibly and effectively. To that end, the battery energy storage community has developed comprehensive policy recommendations designed to prevent any future incident like Moss Landing and maximize the safety of all future and operating storage facilities.

1

ENSURING SAFETY AT ALL NEW BATTERY ENERGY STORAGE FACILITIES

The battery energy storage industry actively promotes the adoption and enforcement of the latest national fire safety standards. The industry has supported the integration or adoption of National Fire Protection Association (NFPA) Standard 855 (Standard for the Installation of Stationary Energy Storage Systems) in nearly a dozen states and continues to support policymakers in their effort to establish uniform best practices. **Adopting and enforcing the latest edition of NFPA 855 is the best approach to ensure safety at all future battery energy storage facilities.**

2

ADVANCING SAFETY ACROSS OPERATING BATTERY ENERGY STORAGE FACILITIES

The energy storage industry is committed to working with state and local officials to advance the latest safety standards and review certain energy storage facilities that predate NFPA 855 and take necessary corrective actions.

These actions include 1) **inspecting** certain facilities built prior to NFPA 855 adoption, 2) conducting **hazard mitigation analysis**, 3) consider the use of **fire barriers** or engineered solutions to meet **large-scale fire testing requirements**, 4) and ensuring all facilities have **emergency response plans**.

3

PARTNERING WITH COMMUNITIES & FIRE OFFICIALS

In addition to promoting the use of best practices and the latest safety features and strategies, the energy storage industry is committed to engaging local communities and fire officials to ensure their specific safety concerns and needs are addressed. The industry works with fire officials on **safety planning** and stands ready to partner with the state to continuously improve safety practices, inform **siting and permitting** processes, and provide educational support and **training** to state and local personnel.



Photo credit: LG Energy Solution Vertech