RENEWABLE NORTHWEST

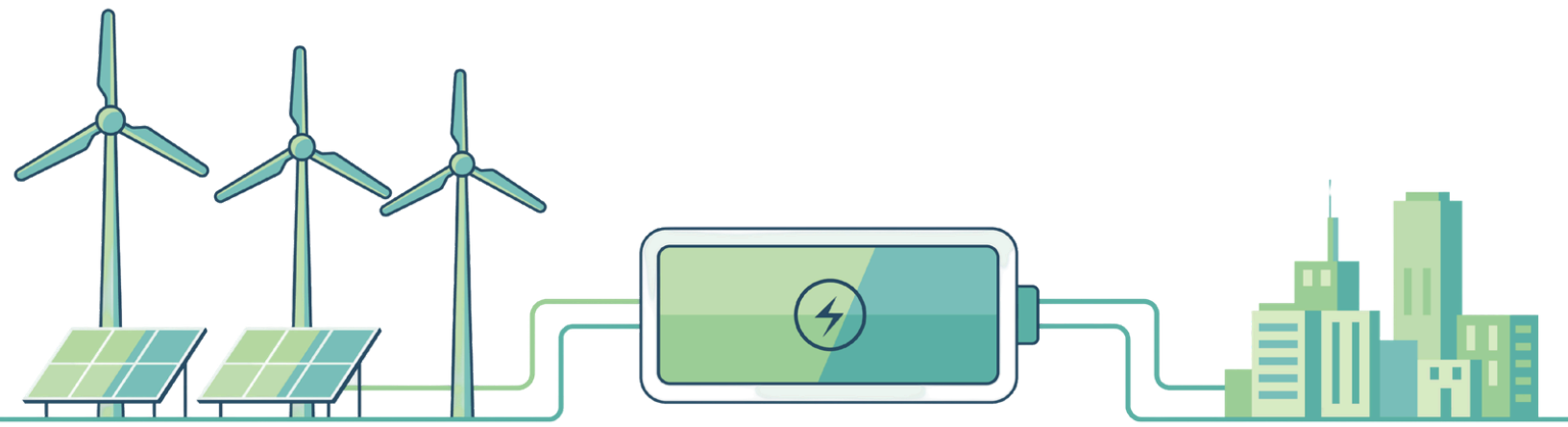
BESS Safety Standards

What is BESS?

Battery energy storage systems, often referred to as BESS, store electricity for later use. When electricity generation exceeds demand, electricity from all energy sources, including wind, solar, hydropower, geothermal, and natural gas, can be stored in batteries and discharged when additional power is needed.

How BESS Safety Is Managed

BESS safety is managed through layers of protection: tested equipment, national safety standards, site-specific design, real-time monitoring, trained operators, and coordination with local fire and emergency response agencies. Safety standards do not eliminate every risk, but they give communities a clear framework for evaluating, managing, and reducing risk.



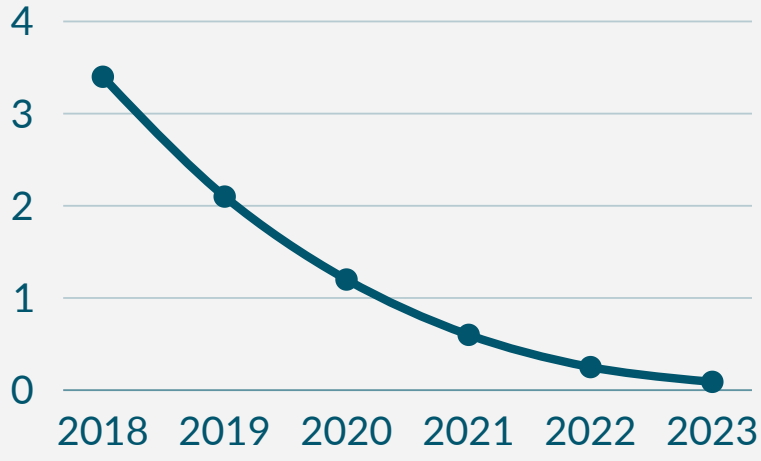
What the Safety Data Shows

Electric Power Research Institute's (EPRI) BESS Failure Incident Database publicly tracks reported battery energy storage system incidents. EPRI reports that the global BESS failure rate per deployed capacity dropped 97% from 2018 to 2025. This trend occurred as battery storage deployment increased rapidly, and as lessons from earlier projects were incorporated into newer designs, testing, standards, and operating practices.

EPRI's data is an important safety reference, but it should be understood in context. Incident datasets rely on public reporting and available information, and may not capture every relevant incident. Even with that limitation, the trend is useful: **as BESS deployment has grown, BESS failure rate per gigawatt-hour of deployed capacity has declined by 97%.**

BESS Incident Rates Have Declined 97% Since 2018

Reported fire and thermal-runway incidents per GWh of deployed battery energy storage capacity



Source: EPRI Battery Energy Storage System Failure Incident Database

Key drivers in the decline of safety incidents:

- Stronger safety standards and fire-code requirements
- Large scale testing, such as UL 9540A and broader use of NFPA 855
- Improvements in battery management systems, enclosure design, and thermal controls
- Lessons learned from earlier projects incorportated into newer designs and operations

Why BESS Safety Planning Matters

As BESS projects become more common across the Pacific Northwest, local governments, fire departments, utilities, and developers all have a role in ensuring projects are reviewed, built, and operated safely.

Like other energy infrastructure, BESS facilities require clear standards, site-specific planning, and coordination with local emergency responders. Safety standards give communities a common framework for understanding how risk is evaluated, what safeguards are required, and what information should be available during project review.

Clear and consistent safety expectations also support better project review. When communities use established standards and predictable review processes, projects can be evaluated more efficiently, reducing uncertainty, avoiding unnecessary delays, and helping utilities plan for reliable electric service at a reasonable cost.

For communities, that can mean a clearer process, better coordination with emergency responders, and more confidence that project-specific safety questions are being addressed before construction begins.

How BESS Safety Has Evolved

BESS technology and safety practices have changed significantly over the past decade. Early projects helped identify where stronger standards, better monitoring, improved emergency response planning, and more detailed testing were needed. Those lessons are now reflected in current project design, national standards, and local review processes.

Modern BESS facilities are generally designed with more advanced monitoring, clearer equipment spacing requirements, more detailed fire-safety testing, and stronger coordination with first responders than many earlier projects. This evolution is one reason the industry has seen a sharp decline in the failure rate per deployed capacity even as total deployment has grown.



Safety Standards Provide a Framework

Local leaders do not need to become battery safety experts to evaluate BESS projects. They do need to know which standards apply, which experts should review the project, and what information should be available before a project is approved.



Modern BESS projects are typically reviewed against national safety standards, testing protocols, fire codes, building codes, electrical codes, and state and local permitting requirements. Together, these standards help address system design, equipment testing, emergency access, fire protection, monitoring, operations, and coordination with first responders.

NFPA 855: The Core Safety Standard

The National Fire Protection Association's (NFPA) 855 Standard for the Installation of Stationary Energy Storage Systems is the primary national standard for the safe installation of BESS.



NFPA 855 addresses key safety questions local officials and emergency responders are likely to ask, including:

- Where can systems be located on a site?
- How much separation is needed between battery units, buildings, roads, and property lines?
- What fire detection, suppression, ventilation, and explosion-control systems are required?
- What information should be available to local fire officials?
- What emergency response and operations plans should be in place?

For communities, NFPA 855 provides a common framework for reviewing BESS proposals while allowing local governments to account for site-specific conditions.

UL 9540 and 9540A: Testing Thermal Runaway

UL standards help evaluate whether BESS equipment has been tested and certified for safe use.

UL 9540	A safety standard for energy storage systems and equipment. It helps confirm that the overall system meets established safety requirements.
UL 9540A	The national test method used to evaluate how BESS behaves during a thermal runaway event, a serious situation where a battery cell overheats and can generate additional heat in a self-reinforcing cycle. The test results can inform system design, spacing, ventilation, fire protection, and emergency response planning.

For local governments, the goal is not to independently interpret highly technical testing data. The goal is to confirm that the project team has provided applicable UL testing and certification information, and that qualified reviewers, such as the fire marshal, fire district, or Authority Having Jurisdiction, have reviewed how that information is reflected in the project's spacing, enclosure layout, ventilation, fire protection, and emergency response plan.

Modern BESS Design Includes Multiple Layers of Protection

These systems are intended to detect abnormal conditions early, limit the spread of a problem if one occurs, and support a coordinated response. They also reflect lessons learned from earlier BESS incidents and from ongoing testing, standards development, and operational experience.
Modern BESS projects are designed with multiple layers of safety. These may include:

- Temperature monitoring
- Remote monitoring
- Automatic shutdown features
- Fire detection systems
- Ventilation or gas management systems
- Physical separation between units
- Emergency access and response planning
- Outdoor, containerized units with external access
- Operations and maintenance protocols
- Training for on-site staff or operators, as applicable

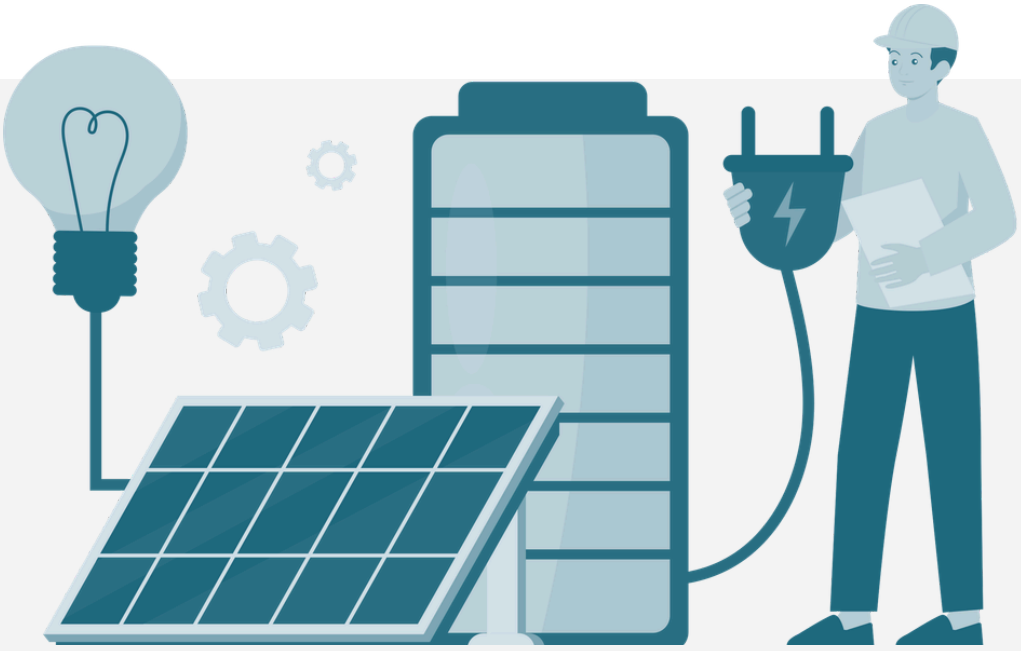
Emergency Response Coordination

BESS safety is strongest when local responders are involved early. Developers should coordinate with the local fire district, county emergency management staff, planning staff, and the Authority Having Jurisdiction before construction.

Local governments can ask project applicants for:

- NFPA 855 compliance documentation
- UL 9540 or UL 9540A testing information
- A site-specific emergency response plan
- Training or site walk-throughs for local responders
- Operations and maintenance information, including who will monitor the facility and respond to alarms or abnormal conditions

Communities do not need to start from scratch. Established standards and early coordination can help local leaders ask the right questions, protect public safety, and support a predictable permitting process.



Scan for sources

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BESS Safety Standards

SOURCES:

- National Renewable Energy Laboratory (NREL): Battery Storage for Resilience
- American Clean Power (ACP) - NFPA 855: Improving Energy Storage System Safety
- Electric Power Research Institute (EPRI) - BESS Failure Incident Database
- National Fire Protection Association (NFPA) - Standard for the Installation of Stationary Energy Storage Systems
- UL Solutions, UL 9540 and UL 9540A Energy Storage Safety Standards

QUESTIONS?

Contact renewables@renewablenw.org

