

UL 9540 & IEC 62619 Technical Compliance Register: ESS Fire Safety Standard Compliance Certificate

UL 9540 & IEC 62619 TECHNICAL COMPLIANCE REGISTER: ESS FIRE SAFETY STANDARD CERTIFICATE

EXECUTIVE SUMMARY

This document serves as the definitive technical compliance register and product overview for our Energy Storage System (ESS) portfolio, with a specific and rigorous focus on achieving and surpassing global fire safety standards. As a Tier-1 global energy storage vendor, we recognize that safety is not merely a regulatory requirement but the foundational pillar of long-term asset reliability and bankability. This register details the multi-layered safety architecture, active thermal management protocols, and stringent testing regimes that underpin our UL 9540 and IEC 62619 certifications. Our commitment to fire safety is integrated from the cell chemistry selection through to system-level control logic, ensuring our BESS solutions offer the highest level of protection for personnel, property, and the broader grid infrastructure. The following sections provide a comprehensive overview of our certified systems, designed for safe, reliable, and efficient operation in any commercial and industrial (C&I) or utility-scale deployment.



SYSTEM ARCHITECTURE & SAFETY

The foundation of our fire-safe ESS is a meticulously engineered system architecture that prioritizes prevention, detection, and suppression. At the core is our proprietary Battery Management System (BMS), which operates at the cell, module, and system levels to provide granular control and real-time monitoring.

- PREVENTION: Our systems utilize only Tier-1 LFP (Lithium Iron Phosphate) cells, inherently the safest lithium-ion chemistry with the highest thermal runaway threshold (exceeding 270°C). The passive safety of LFP is the first and most critical layer of defense. Furthermore, our intelligent liquid cooling system maintains cells within a narrow optimal temperature band, preventing the conditions that can lead to thermal stress or degradation.

- DETECTION: The BMS is complemented by a multi-layered detection network that includes:

- * Early Warning Gas Detection: Sensors continuously monitor for the presence of off-gases (e.g., CO, VOCs, H₂) that precede thermal events, allowing for intervention before temperatures escalate.

- * Distributed Temperature Sensing (DTS): Fiber optic cables provide real-time temperature mapping along the entire battery string, identifying hot spots at their inception.

- * Continuous Insulation Monitoring: Detects any degradation in insulation resistance, a precursor to potential internal short circuits.

- SUPPRESSION: In the unlikely event of a fire, our systems are equipped with an automatic, multi-stage fire suppression system. The primary agent is a clean, non-conductive, and environmentally benign gas (e.g., Novec 1230 or FM-200) that rapidly extinguishes flames without damaging equipment. A secondary water deluge system is integrated into the container design as a final fail-safe to prevent fire spread to external assets and ensure the container's structural integrity under extreme conditions. All suppression activations are triggered by a combination of heat, smoke, and gas detection signals to prevent false alarms and ensure a rapid, targeted response.

KEY FEATURES

- Feature 1: UL 9540 & IEC 62619 Certified: Full system compliance with the most stringent North American and international safety standards for energy storage systems, ensuring bankability and streamlined permitting.
- Feature 2: Advanced Gas Detection and Ventilation: Integrated sensors provide pre-emptive warning of thermal events, automatically initiating ventilation and suppression protocols to mitigate risk.
- Feature 3: Passive Fire Barriers: Each battery module is housed within a fire-resistant enclosure, and modules are physically separated to contain any potential event and prevent cascading failures.
- Feature 4: 24/7 Cloud-Based Remote Monitoring: Our proprietary EMS enables continuous health and safety monitoring, with automated alerts and remote diagnostics to provide immediate notification of any anomaly.
- Feature 5: Tier-1 LFP Cell Integrity: Cell-level safety is ensured through rigorous manufacturing quality control and a proven, stable lithium-iron-phosphate chemistry, minimizing the risk of thermal runaway.

COMPLIANCE & STANDARDS

Our commitment to safety is validated by a comprehensive suite of international certifications. The following matrix outlines the key standards our ESS portfolio complies with, ensuring global acceptance and project financing.

- UL 9540: Standard for Safety of Energy Storage Systems and Equipment. This is the premier safety standard for ESS in North America, covering the entire system's electrical, mechanical, and thermal safety aspects.
- IEC 62619: Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes - Safety Requirements for Secondary Lithium Cells and Batteries, for use in industrial applications. This standard validates the safety of our LFP cells and battery modules through rigorous testing for overcharge, over-discharge, and short-circuit.
- UL 9540A: Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems. We have successfully conducted UL 9540A testing at the cell, module, and unit levels, providing quantifiable data to demonstrate the effectiveness of our fire mitigation strategies.
- NFPA 855: Standard for the Installation of Stationary Energy Storage Systems. Our system installation guidelines are fully aligned with NFPA 855, ensuring safe siting and installation.

Parameter	Specification
System Safety Compliance	UL 9540, IEC 62619, UL 9540A Tested
Fire Suppression Agent	Clean Agent (Novec 1230 / FM-200) + Water Deluge
Detection & Monitoring	Gas, Smoke, Heat, Distributed Temperature Sensing (DTS)

Cell Chemistry	Tier-1 Lithium Iron Phosphate (LFP)
Cooling Method	Intelligent Liquid Cooling
Enclosure Rating	IP55 / NEMA 3R
BMS Architecture	3-Tier (Cell, Module, System) with Cloud Connectivity
System Voltage Range	600 - 1500 VDC
Operating Temperature Range	-30°C to 55°C (with de-rating above 45°C)

INDUSTRIAL DEPLOYMENT

Our UL 9540 & IEC 62619 compliant ESS is designed for versatile deployment across a wide range of industrial and commercial applications where safety is paramount. This includes manufacturing facilities, data centers, hospitals, large-scale retail operations, and EV supercharging hubs. The integrated fire safety features ensure that these systems can be safely installed in urban environments, inside or adjacent to buildings, without compromising operational uptime. The turnkey containerized solution significantly reduces installation time and site complexity, providing a robust and secure platform for peak shaving, load shifting, demand response, and backup power.

