

WHITE PAPER

The Fluence Commitment to Safety

by Barbara LaBarge, Elizabeth Pond

Fluence is committed to safety at every level of our business. With more than a decade of experience deploying and operating energy storage systems — as of this writing, approximately 5,140 megawatts (MW) deployed or awarded across 44 markets globally — the Fluence fleet has delivered more than 7.6 million megawatt-hours (MW-hr) of grid services with a strong safety record.

We see safety as a foundational element of our company's value of Responsibility — rooted in our heritage of power generation and industrial systems design. Safety is a particular concern for companies in an

industry that deals daily with the inherent dangers of managing electricity and is an active topic in the energy storage industry today. Safety is all-pervasive in our company culture and the partnerships we build with our customers, from technology and system design to construction and operations.

This white paper explains how Fluence focuses on reducing the inherent danger of managing electricity by identifying risks, developing ways to mitigate them, and promoting practices that advance safety for ourselves, our customers, our communities, and the industry.

Safety is Our Policy

Our formal policies on Health, Safety, Environment and Quality (HSEQ) meet the highest global standards, often exceeding local and regional regulations. Ensuring a safe work environment is explicit in every aspect of our business — all Fluence employees understand they have the authority to stop work if a potential safety hazard is spotted, whether on a project site or in corporate offices — and we continually reinforce our commitment to safety through ongoing education and training. The Fluence Safety Committee coordinates these programs, which include emergency preparedness, asset management, analysis of job safety and lessons learned, and an Integrated Management System (IMS) to monitor, audit, and streamline business practices.

Safety through Design

To ensure safety during operations, it is critical to design and develop systems with world-class safety standards from the start. Our approach considers all phases of potential safety events, with mitigations that seek to prevent an event from occurring in the first place, limit the extent of an event should one occur, and safely conclude it without harm to people.

Fluence designs complete energy storage solutions that operate as a single system, with multiple layers of redundancy and autonomous layers of control, and that perform comprehensive hazard monitoring, detection, and response. This system-level approach enables us to embed safety in every layer of our core technology, system design, and project design. Such an approach is distinctly different from that taken by companies who self-integrate components on a per-project basis.

We are committed to ensuring that new technology designs incorporate the latest safety-related learnings as well as any new applicable standards. Our product development teams regularly review emerging codes and standards, industry best practices, potential safety issues, new customer requests, and lessons learned from the field, which are then applied to current and future designs. Our design and review process involves both internal Fluence domain experts as well as external safety and engineering professionals. Fluence also maintains two laboratories, one in the United States and one in Germany, to perform comprehensive testing, including component and system testing.

Our latest sixth-generation Tech Stack, comprised of integrated hardware (Fluence Cube), operating software (Fluence OS), and digital intelligence engines (Fluence IQ), offers industry-leading safety features incorporated from lessons learned over twelve years of innovation in energy storage systems.



Safety through Principles

Our comprehensive approach to safety is based on five key principles:

1. Intelligent System Design
2. Rigorous Supplier Qualification
3. Protective Components
4. Monitoring
5. Product Testing
6. Safety Procedures

1. Intelligent System Design

Safety is at the forefront of the design approach to our core technology platform and our energy storage systems. Our sixth-generation hardware architecture includes floating voltage battery strings, IP touch-safe components, ground-fault detection, and a Fast-Stop (F-Stop) that allows an on-site operator to stop the system. Additionally, individual components can trigger a shutdown of the whole system if an unsafe condition is detected.

Safety is also found throughout every level of Fluence's control system design, from the Battery Management System (BMS) to the project-level controls platform (Digital Control System (DCS) & Data Acquisition System (DAS)). Fluence controls continuously monitor and detect potential anomalies in the system, isolating and flagging potential problems for immediate operator attention, including alerts to Fluence 24/7 monitoring staff.

Our projects are monitored and controlled by patented control algorithms, including monitoring down to the individual battery cell. This proprietary storage operating system optimizes the use of all technologies deployed in the project and delivers up-to-the-second visibility into the performance of the unit.

Fluence works with suppliers to ensure all subsystems protect themselves in the event of a fault or other failure in another subsystem, such as communications loss. Additionally, the Fluence DCS is designed to incorporate all warnings, limits, and fault information provided by supplier subsystems, as well as provide an additional layer of protection in the control system to ensure safe and reliable system operation.

2. Supplier Qualification

While safety controls and system design are key to safety, the quality and safety of the underlying components is also critical. Fluence only works with top tier suppliers of system components, including batteries, power conversion, containerization, disconnects, switchgear, HVAC, and a plethora of other components that go into the system design.

In total, Fluence manages nearly 40 key supplier relationships and has put in place a series of evaluation and certification processes for each of them, much of which came from the lessons learned and practices developed at Siemens. Vendors go through an extensive pre-qualification process in the Fluence Technology Labs, including battery and PCS testing at limits of intended use and corner cases, to check system behavior and performance under varying operating conditions.

BATTERIES

For batteries to be deployed in a Fluence energy storage system, battery manufacturers must first certify their technology and meet our specifications and relevant UL or IEC certification, which requires on-site testing and extensive diligence of the cell-, module-, and system-level limits. While our battery installations are stationary, the batteries being

used are often the same or similar designs as those that undergo rigorous testing for automotive applications.

Fluence battery subsystems are designed to prevent and mitigate safety incidents. All Fluence-certified battery subsystems meet the following requirements and qualifications:

- **Manufacturers are ISO9001 and ISO14001 certified**
- **Battery cells are certified to IEC62619**
- **Battery modules and low-voltage switchgear are certified to UL1973 and IEC61000-6**
- **Low-voltage directive compliance for the EU (LVD 2014/35/EU)**
- **Transportation of dangerous goods compliance to UN 38.3**
- **Have undergone rigorous testing by manufacturers including destructive testing**
- **Are cells used in transportation applications or similar designs**
- **Use battery racks compliant with UL1973 and IEC62619**
- **Use battery modules and containers designed for UL9540, UL9450A, and NFPA 855**

3. Protective & Preventive Components

We employ multiple layers of protective and preventive components throughout our systems to provide failsafe protections and collect information needed to prevent and mitigate unsafe consequences of a failure. We work closely with subcomponent manufacturers on root cause analysis of issues and this feedback is incorporated as part of lessons learned into future design improvements under a rigorous quality management process. The protective and preventive components are designed to prevent, limit, and safely conclude an event should one occur and are based on stringent industry standards, including NFPA 855 and UL9540A. They include:



BATTERY MANAGEMENT SYSTEMS

The BMS is the first line of defense in detecting abnormal conditions. It collects data at the battery cell and module levels, monitoring temperature, voltage, current, state of charge, and state of health. The BMS identifies abnormal battery conditions or deviations in normal system operating conditions and sends data and warnings to Fluence controls for additional monitoring, action, and reporting.



HVAC

HVAC systems maintain environmental temperature and manage humidity to maintain the optimal conditions for the batteries.



POWER QUALITY METERS

Power quality meters are deployed at our projects. The meters check for damaging harmonics or flicker that could cause damage to electrical equipment.



GROUND FAULT DETECTION

Electrical ground fault devices are monitoring each DC battery bus. The devices detect faults and disconnect the system before a serious problem such as shorts or overcurrent events could occur.



F-STOP

Fluence energy storage systems employ a sophisticated F-Stop. F-Stop can be triggered throughout all levels of the DCS. A protective circuit deenergizes an enclosure (battery or PCS) and electrically isolates the batteries in the event of a fire, an operator input, or a site-wide emergency. The F-Stop can be triggered by Cube hardware, such as activation of the fire suppression system, smoke detector, carbon monoxide sensor, and/or the Leaf Controller signal indicating abnormal battery behavior; by the Fluence OS; or by an operator or first responder.



FIRE ALARM SYSTEM

Each Cube has its own fire alarm system that includes smoke, carbon monoxide, and temperature detectors that trigger an external horn, strobe light, F-Stop, and an aerosol suppressant if installed to prevent the spread of fires to batteries. The primary role of the aerosol cannister is extinguishment of a non-battery fire before it spreads to cells, covering Class A (paper, wood, textiles, and plastics), B (flammable liquids), and C (electrical equipment) hazards. It is designed to account for no-harm concentration levels to humans. Fluence complies with all applicable local product and fire codes and actively monitors new standards developments from NFPA, IFC, UL, and IEC.



NON-PROPAGATION

The Fluence Cube incorporates batteries that have demonstrated non-propagation of thermal runaway in UL 9540A testing. In the event of a fire, the affected Cube will electrically isolate itself and is designed to contain any fire inside and prevent propagation to battery modules in adjacent containers.



INCIPIENT GAS DETECTION

When batteries first show signs of physical distress, they release gases created by heating and/or chemical processes in the cells. Gases released include volatilized electrolyte and some products of early chemical decomposition such as carbon monoxide, hydrogen, ethane, and propane. The system can interrupt the event at this stage by detecting these incipient battery off-gases or electrolyte leakage and triggering an F-Stop for electrical isolation.



DEFLAGRATION PANELS

In the very unlikely event of propagating thermal runaway that causes batteries to release combustible gases, deflagration panels compliant with NFPA 68 are built into every Cube to direct the force of any pressure up and away from humans. The pressure release serves to minimize structural and mechanical damage, and more important, to minimize the safety risk to operators or first responders.



NO ENTRY NECESSARY

The approximately 8x8x8-foot Fluence Cube is entirely filled with equipment – accessible from the door – making it unnecessary and impossible for operators or first responders to enter the container.



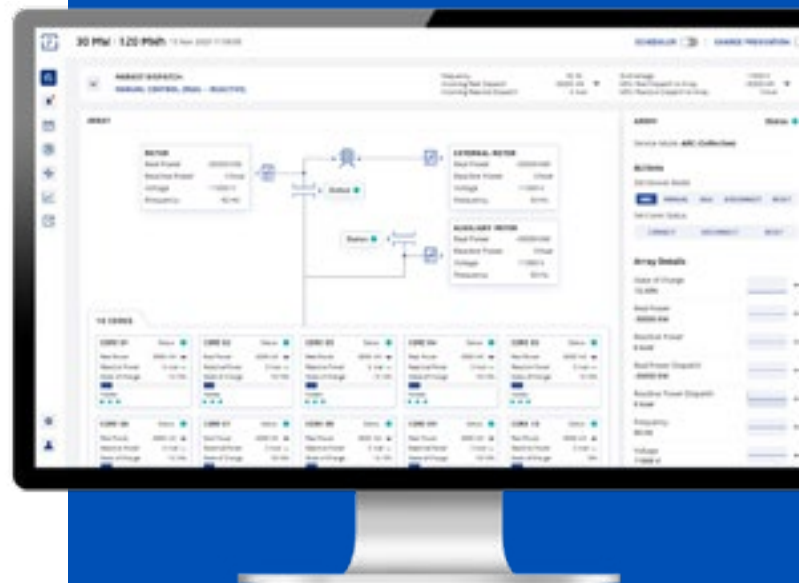
SYSTEM LIMITS

The system limits are the parameters we use to ensure safe operation. If a parameter reaches a warning level, the charging and/or discharging capability of the affected portion of the system is appropriately reduced to ensure continued safe operation until the issue is cleared. If a parameter goes beyond a warning and reaches an alarm state, the Node's charging and/or discharging capability is correspondingly reduced to zero. Fluence DCS limits are complementary protections to the manufacturer hardware limits, which will also trigger a system shutdown.

4. Monitoring

Monitoring is critical in preventing and responding to safety risks and events. We extensively monitor our systems to ensure safe operation, optimal performance, maintain system health, and proactively prevent incidents. With a large installed base, Fluence can detect emerging issues in one part of its fleet and develop countermeasures to be proactively installed in other parts. Fluence provides remote monitoring as part of our Operational Services packages and works with customers on remote monitoring and control strategies.

- Typically, systems have 24/7 remote monitoring. This remote monitoring allows for the detection of a potential event before it occurs.
- High-priority alerts are sent to a 24-hour monitoring service where operators can take immediate action according to Standard Operating Procedures (SOPs) if appropriate.
- Typically, more than 30,000 data points are collected every two seconds for a 20 MW project, providing system insights and supporting continual improvements for our systems.



6. Product Testing

UL9540A TESTING

Fluence's sixth-generation products have completed UL9540A tests at the cell, module, and unit levels. The unit-level test carried out in June 2022 found that the single initiating cell caused propagation to only 3 adjacent cells and there was no propagation to neighboring modules and no fire, confirming the previous cell and module level UL9540A testing.

- Fluence designed its system for non-propagation and has tested to UL9540A to meet the performance requirements of UL9540 and NFPA-855.
- Fluence's products are UL9540A tested at the Cell (Rev 3 and 4), Module (Rev 3 and 4), and Unit (Rev 4) levels.

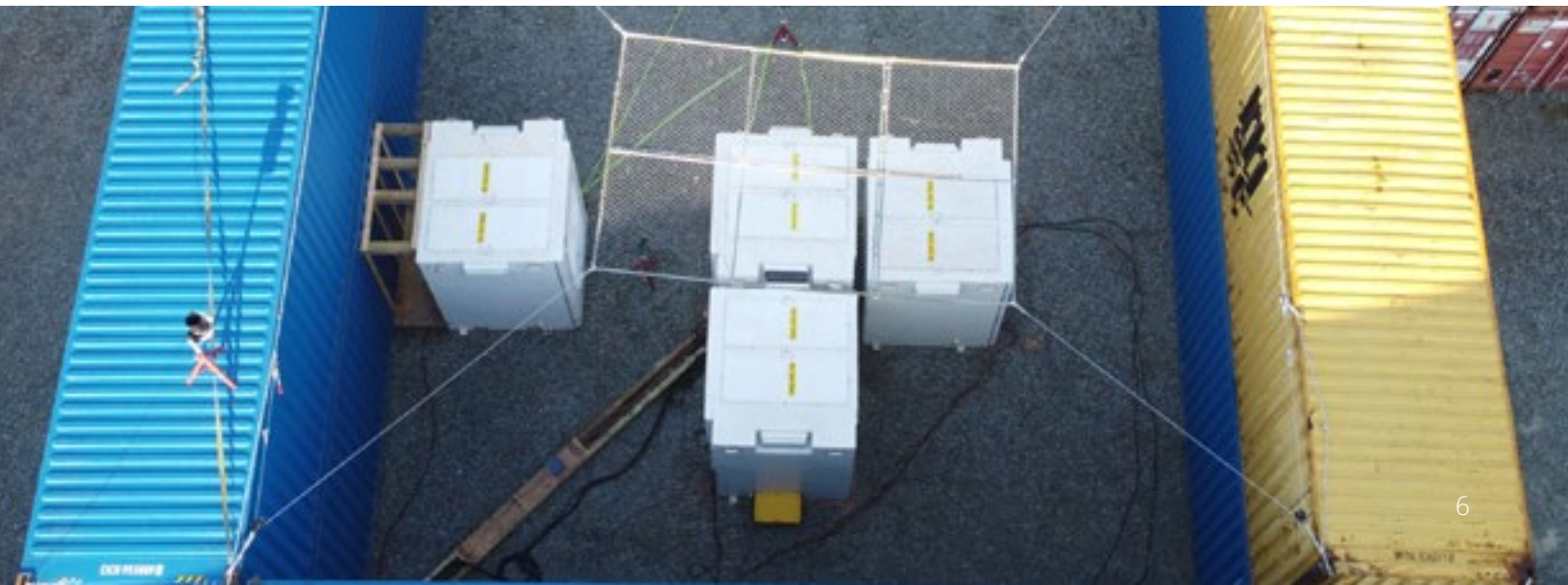
LARGE-SCALE FIRE TESTING

Surpassing the highest UL requirements for storage product safety

Fluence has surpassed UL9540A testing requirements, working with DNV to execute a successful large-scale fire test designed to evaluate an extreme battery failure event by triggering a significant portion of the battery into thermal runaway. The test included three target Cubes placed around an initiating cube to simulate a typical system configuration. All four Fluence Cubes were loaded with 745 kWh of LFP batteries each. The full test lasted approximately 16 hours and successfully demonstrated that, even under an extreme event, propagation to neighboring Cubes within Fluence's energy storage systems was limited to the initiating Cube.

“ Few companies understand how battery storage systems will perform under a large-scale failure and how to help protect first responders during such an event. Fluence has taken a significant step forward by performing a full large scale installation level fire and explosion test. The tests were very successful in showing that propagation was limited to the initiation Cube. The test did not result in a deflagration event and even with a fully engaged container the failure was limited to one container with no propagation between containers at distances below the code requirements. This test will help define safety standards moving forward.”

Paul Hayes
General Manager, American Fire
Technologies, NFPA-855 Board Member





6. Safety Procedures

Safety first, and the view that every accident is preventable, are foundational beliefs at Fluence. In addition to corporate safety procedures, we implement stringent safety protocols at every job site with which we are involved and provide safety trainings for system owners that are also available to first responders.

LOCK-OUT TAG-OUT

Our systems are equipped with physical lock-out tag-out (LOTO) safety features, plus a controls lock-out to prevent injury. LOTO procedures are included in safety training and reviewed as part of the job safety analysis. LOTO is used in conjunction with local approaches. We strive to execute LOTO as a first step in every asset with the physical infrastructure sufficient to complete it. Absent that technology, we implement practices per the local standards. For example, in Germany there are five safety rules that must be followed, and it is required that the technician is “Elektrofachkraft” (an electrically qualified person).

SAFETY TRAINING

Fluence works diligently to provide thorough system awareness training through our documented training program. The program consists of System Orientation, System Operations, System Maintenance, and System First Responder training. This training is tailored to site specifics and includes descriptions of hazards as well as details on equipment and layout of the site and is used by owners in their development of site safety procedures to include in their Emergency Action Plans (EAPs). Fluence provides templates for these EAPs and related information to assist

owners in completing their own site-specific response plans. A crucial element of these plans is to ensure the owner has a clear process for removing people from the immediate vicinity of the system during an emergency event and for supplying critical information to first responders to keep them out of harm’s way.

EMERGENCY RESPONSE TEAMS

We provide our customers with awareness training and documentation about the full installation and technology at the site to share with first responders. We recommend that our customers invite the first responders to the training we provide.

FIREFIGHTER TRAINING PROGRAM

Fluence is rolling out a standalone firefighter training program to raise awareness of energy storage among first responders and firefighters around the U.S. and teach them how to safely interact with systems. As a leader in the sector, we believe it is important to proactively educate as many people as possible about how energy storage works and how to safely manage any potential incidents. The 8-hour training course is designed to give first responders an understanding of how lithium-ion battery-based energy storage systems operate, with detail on system design, types of failure modes, potential hazards, and more. The course is delivered by a qualified instructor in a virtual setting (in-person sessions will begin when COVID-19 safety concerns abate). Once first responders have completed the course, they will be able to sign up to deliver the course to other first responders, expanding the reach of the training.

Safety through Standards

Fluence projects and teams around the world conform to the **OHSAS 18001**, **ISO 14001**, and **ISO 9001** Health, Safety, Environment, and Quality standards. In addition, Fluence has achieved formal certification for OHSAS 18001, ISO 14001, and ISO 9001 at our German entity to meet requirements for European markets.

OHSAS 18001

Compliance with the OHSAS 18001 international occupational health and safety standard demonstrates our commitment to creating and maintaining management systems that provide our customers and employees with an incident-free environment aimed at preventing occupational injuries. Specifically, we monitor, identify, and discuss safety risks in monthly all-hands safety meetings. Other compliance activities include on-site safety walks, incident reporting, and ongoing online safety training.

Fluence has implemented a Safety Observation System (SOS) called Stop Work Authority (SWA). Everyone in the company is trained to use the SWA, and to be aware that safety is everyone's responsibility. Fluence Safety Culture encourages reporting of observations and recognizes and rewards teams and individuals for SWA and safety. Fluence reacts to observations and corrects them before they become incidents.

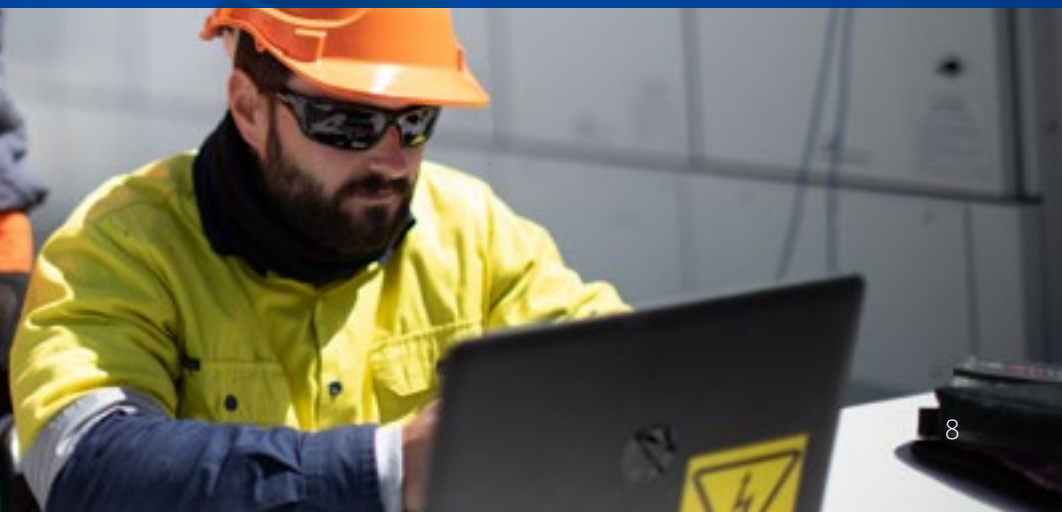
ISO 14001

The ISO 14001 international standard provides a framework for organizations to incorporate environmental management into their other key management systems. Fluence's global compliance with ISO 14001 is reflected in our commitment to minimize and prevent adverse environmental impacts of our projects by conserving resources and improving energy efficiency at the planning and purchasing stages.

ISO 9001

Compliance with the ISO 9001 standard ensures that an organization maintains a process-oriented approach to documenting and reviewing the structure, responsibilities, and procedures required to achieve the highest levels of quality management. At Fluence, our compliance with this standard is a key part of our commitment to providing our customers with the highest quality of engineering, procurement, and construction products and services.

Fluence maintains an Integrated Management System (IMS) that drives the continuous improvement cycle process targeted in ISO 9001. We perform regular audits on the procedures and processes we use to conduct our business and set our supplier qualifications. We also perform regular analyses to identify areas for improvement.



Safety through Continual Improvement & Leadership

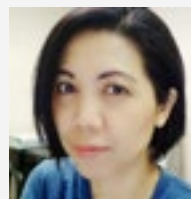
The Fluence fleet has delivered more than 7 million megawatt-hours (MW-hr) of energy storage safely and reliably in a wide variety of physical environments around the world, from the tropics to north of the Arctic Circle. We know that sustaining this record requires continued vigilance and learning, and we actively seek out areas where we can raise the bar, working with the U.S. National Fire Protection Association (NFPA), regulators, and industry associations to share lessons learned and advance safety standards and technology best practices for both ourselves and the industry as a whole.

Meet our Global Safety & Quality Team Leads



Barbara LaBarge
GLOBAL SAFETY & QUALITY MANAGER

Barbara oversees the team that identifies risks, develops ways to mitigate them, and implements those precautions to continually improve safety for ourselves, our customers, our communities, and the industry. Barbara is an Air Force veteran who moved from military aviation safety & quality to NASA, where she helped write the mishap plan for the International Space Station and other projects and won a medal for her safety and quality work. Fluence labs use some of the safety & quality best practices used at NASA.



Fermida DeLeon
APAC SAFETY & QUALITY MANAGER

Fermida leads safety and quality activities for Fluence in the Asia Pacific region, overseeing multiple project sites simultaneously as we help deploy Southeast Asia's largest portfolio of energy storage projects for a single customer (650 MW). She also oversaw the rigorous process of getting Fluence's Australia operations ISO 9001:2015 certified.



ABOUT FLUENCE

Fluence (Nasdaq: FLNC) is a global market leader in energy storage products and services, and digital applications for renewables and storage. Fluence provides an ecosystem of offerings to drive the clean energy transition, including modular, scalable energy storage products, comprehensive service offerings, and the Fluence IQ Platform, which delivers AI-enabled digital applications for managing and optimising renewables and storage from any provider. The company is transforming the way we power our world by helping customers create more resilient and sustainable electric grids.