COUNTY OF MONTEREY

Guidelines for Battery Energy Storage System Facility Safety

Emergency Action Planning

2026

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1 Introduction

The development of lithium-ion battery technology and the installation of large Battery Energy Storage Systems (BESS) has added important new capabilities to electric grids, improving reliability, load balancing, and renewable integration. These benefits are accompanied by safety risks, notably thermal runaway, gas release, and potential fire or explosion hazards. As BESS facilities increase in scale and geographic reach, guidance on comprehensive emergency planning is essential. This document, Guidelines for Battery Energy Storage System Facility Safety Emergency Action Planning, has been developed to support Independent System Operators (ISOs), facility owners, first responders, and emergency planning personnel in preparing a site-specific Emergency Action Plan (EAP). These guidelines incorporate established industry standards, best practices, lessons learned from past incidents, and the latest regulatory developments. This guidance is not prescriptive but serves as a baseline to ensure critical elements are considered in developing a comprehensive BESS EAP. Furthermore, this document is intended to serve as a foundation that ISOs and stakeholders can build upon as knowledge, technology, and practices continue to evolve.

1.1 Purpose

The purpose of this document is to provide guidelines for the preparation of an EAP for a BESS facility located in Monterey County, California. This document outlines emergency response planning recommendations for BESS facilities. For the purposes of this guide, a facility is assumed to be subject to the CPUC modified General Order (GO) 167-C emergency response and emergency action planning requirements, which apply to all Generating Assets and Energy Storage Systems rated greater than 1 Megawatt (MW). This document seeks to facilitate the development of plans that are comprehensive and consistent. EAP effectiveness can be enhanced by a uniform format that ensures that all critical aspects of emergency planning are covered in each plan. Uniform plans and coordination with public safety authorities assist in facilitating a timely response to a developing or actual emergency. The intended readers of this document are ISOs, first responders, and emergency management authorities who work together in the response to BESS facility safety emergencies.

The objective of this guidance is to improve preparedness by defining clear expectations for risk identification, scenario modeling, interagency coordination, and community protection measures. It emphasizes the need for robust modeling of potential gas releases and thermal events, combined with spatial mapping to inform evacuation or shelter-in-place decisions. Importantly, these guidelines are designed to be practical, scalable, and applicable across a range of system sizes and technologies, while maintaining flexibility to adapt to site-specific characteristics. They are aligned with existing codes and standards and applicable environmental and emergency management protocols. BESS stakeholders can use this guidance not only as a compliance resource, but as a tool to foster collaboration between experts, public safety agencies, and communities.

1.2 Regulatory Framework

The EAP should be developed in strict compliance with all applicable regulatory requirements and aligned with federal, state, and local standards. While not exhaustive, below contains relevant information concerning federal, state and local standards. There may be additional relevant regulatory requirements and below may change as this is a quickly developing area of the law.

1.2.1 National Fire Protection Association (NFPA) 855

National Fire Protection Association (NFPA) 855, *Standard for the Installation of Energy Storage System*s (2023

Edition)[*] provides minimum requirements for mitigating the hazards associated with energy storage systems (ESS). This standard outlines how far BESS must be placed from buildings and property lines, ventilation requirements, fire suppression system guidelines, and emergency responder access. It incorporates UL 9540 and UL 9540A[†] safety testing results to inform installation best practices. NFPA 855 also mandates coordination with local authorities having jurisdiction (AHJs), ensuring that each installation meets local codes and fire department expectations. NFPA 855 requires several submittals to the AHJ, including the results of fire and explosion testing conducted in accordance with UL 9540A, details of all safety systems, the hazard mitigation analysis (HMA), and the emergency response plan.

Changes to Chapters 3, 12, and 80 of the California Fire Code are intended to ensure battery facilities are constructed to the latest fire safety standards including the 2023 edition of the NFPA 855 standard. These updated regulations were adopted on March 7, 2025 and will take effect on January 1, 2026[‡]. It is important to note that while the 2023 update to NFPA 855 generally cannot be applied retroactively to existing installations, it allows an AHJ to request a hazard mitigation analysis for existing installations that are not UL 9540 listed, and to retroactively apply any portions of the new standard 'deemed appropriate to mitigate any hazards' identified as unacceptable.

1.2.2 National Fire Protection Association (NFPA) 1660

NFPA 1660, *Standard for Emergency, Continuity, and Crisis Management: Preparedness, Response, and Recovery* (2024 Edition)[§] emphasizes the importance of comprehensive pre-incident planning, including the collection and organization of site-specific information such as system layout, battery type, hazard identification, access points, emergency shutoffs, water sources, fire protection systems, and response procedures. The intent is to provide first responders with the necessary data to make informed decisions during an incident.

1.2.3 Hazard Mitigation Analysis (HMA)

Chapter 1207 of the California Fire Code (CFC) and NFPA 855 standards, currently require a HMA to be performed under the certain conditions for an energy storage system. An HMA is an evaluation of potential failure modes, the resulting consequences, and mitigation measures that are in place to reduce the impacts. The HMA outlines mitigation strategies including fire detection and suppression systems, gas detection and ventilation, thermal management through Battery Management Systems (BMS), proper spacing of units, and emergency shutdown capabilities. The analysis also ensures that emergency response plans, signage, and fire department access are integrated into the facility design. Overall, the HMA supports the safe operation of the facility by aligning with current codes and providing first responders with the information and infrastructure needed to manage potential incidents successfully.

1.2.4 Hazardous Material Business Plan (HMBP)

The State of California and the County of Monterey require an owner or operator of a facility to complete and submit annually in the California Environmental Reporting System (CERS), a Hazardous Material Business Plan

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[*] National Fire Protection Association (NFPA) 855, Standard for the Installation of Energy Storage Systems (2023 Edition)
[†] UL 9540A Test Method for Battery Energy Storage Systems
[‡] Senate Bill No. 283, Energy Storage Systems (Clean Energy Safety Act of 2025), Chapter 407, Statutes of 2025, California Legislature
[§] National Fire Protection Association (NFPA) 1660, Standard for Emergency, Continuity, and Crisis Management: Preparedness, Response, and Recovery (2024 Edition)

(HMBP) if the facility handles a hazardous material or mixture containing a hazardous material that has a quantity at any one time during the reporting year equal to or greater than 55 gallons (liquids), 500 pounds (solids), or 200 cubic feet for a compressed gas.[*] The HMBP provides basic information necessary for use by first responders to prevent or mitigate damage to the public health and safety, and to the environment from a release or threatened release of a hazardous material. This includes an inventory of hazardous materials at a facility, as well as training requirements, emergency response plans, and procedures to be followed in the event of a reportable release or threatened release of a hazardous material. [†] The HMBP should also include a site map that contains north orientation, loading areas, internal roads, adjacent streets, storm and sewer drains, access and exit points, emergency shutoffs, evacuation staging areas, hazardous material handling and storage areas, and emergency response equipment.

HMBP reporting for batteries in CERS presents a challenge because of the mixed chemical composition. To address this challenge, the Unified Program Administration and Advisory Group created a Battery Reporting Guidance for Unified Program Agencies.[‡] A BESS facility subject to this guide must include Standard Operating Procedures (SOPs) as part of its Hazardous Materials Business Plan (HMBP). These SOPs should cover, but are not limited to, routine monitoring, regular maintenance, inspection schedules, safe handling of batteries and associated chemicals, spill prevention and containment, and personnel training. The County of Monterey Health Department, Environmental Health Bureau (EHB), will review these SOPs, along with corresponding logs and records, during routine inspections conducted under the site's Health Permit to ensure compliance with applicable safety and environmental regulations.

1.2.5 Senate Bill 38

California Senate Bill (SB) 38[§], codified in Public Utilities Code Section 761.3, requires battery energy storage facilities in the state to develop an Emergency Response and Emergency Action Plan covering the entire facility. The facility owner or operator must coordinate with local emergency management agencies, unified program agencies, and first responders while developing the plan and submit the plan to the applicable county and, if applicable, the city where the facility is located. SB 38 requires the Emergency Action Plan to:

1. Establish response procedures for an equipment malfunction or failure.
2. Include procedures that provide for the safety of surrounding residents, neighboring properties, emergency responders, and the environment. These procedures shall be established in consultation with local emergency management agencies.
3. Establish notification and communication procedures between the battery energy storage facility and local emergency management agencies.

Additionally, SB 38 notes that the Emergency Response and Emergency Action Plan may:

1. Consider responses to potential offsite impacts, including, but not limited to, poor air quality, threats to municipal water supplies, water runoff, and threats to natural waterways.
2. Include procedures for the local emergency response agency to establish shelter-in-place orders and road closure notifications when appropriate.

[*] California Health and Safety Code, HSC § 25507
[†] California Health and Safety Code, HSC § 25504(b)
[‡] Battery Reporting Guidance for Unified Program Agencies (March 10, 2022), Unified Program Administration and Advisory Group
[§] SB-38 Battery energy storage facilities: emergency response and emergency action plans, Approved by Governor October 07, 2023

1.2.6 California Public Utilities Commission (CPUC) General Order (GO) 167-C

In 2025, the CPUC modified General Order (GO) No. 167-C[*] in order to add new safety standards for the maintenance and operation of BESS, as required by SB 1383. The CPUC made it explicit that battery storage facility owners must develop emergency action plans, as required by SB 38. In addition, the CPUC made other technical updates to the standards to improve safety, reliability, and effectiveness of operation and maintenance activities, such as establishing technical logbook standards for battery storage systems and expanding requirements for emergency plans that relate to all electric generating facilities[†].

1.3 Scope

A BESS EAP is a site-specific document that outlines the procedures, responsibilities, and resources necessary to respond effectively to emergencies involving battery energy storage systems. The EAP is designed to protect personnel, first responders, and the public from hazards associated with a BESS facility. These hazards may include anomalies such as thermal runaway, fire, toxic gas release, explosion, and electrical failure. An EAP outlines essential facility information, hazard assessment, response and notification procedures, and framework for training and plan maintenance. The ISO is responsible for developing and maintaining the EAP. To strengthen an EAP, it is beneficial for development and implantation to occur in close coordination with applicable emergency management authorities. Through this collaboration, public safety authorities are better positioned to leverage the EAP in support of their operational duties. The EAP guidelines in this document are focused on the development or revision of emergency plans for BESS facilities with the potential to cause loss of life or significant property damage due to failure or other major incidents. The area surrounding each BESS facility is unique. Therefore, the extent and degree of potential impacts of each BESS facility vary.

For the purposes of this guide, a facility is assumed to be subject to the CPUC modified General Order (GO) 167-C emergency response and emergency action planning requirements, which apply to all Generating Assets and Energy Storage Systems rated greater than 1 Megawatt (MW). It is also assumed, the facility is subject to the 2023 revision of NFPA 855, and to have batteries housed in a number of outdoor installations or with total energy exceeding 600 kWh, thus triggering requirements for a hazard mitigation analysis (HMA), fire and explosion testing in accordance with UL 9540A, emergency planning, and annual training. The ISO shall develop one EAP per permit. The EAP shall address all standard facility operations and configurations. For any portion of the facility that deviates from standard configurations, equipment, or operations, the EAP shall include dedicated sections or chapters that specify the applicable procedures and requirements.

1.4 Definitions

To ensure consistency, the following terms, defined in **Table 1**, have been selected for use in this document.

Table 1: Definitions

Term	Definition
Battery	A single cell or a group of cells connected together electrically in series, in parallel, or a combination of both, which can charge, discharge, and store energy electrochemically.

[*] General Order No. 167-C, Enforcement of Maintenance and Operation Standards for Electric Generating Facilities and Energy Storage Systems, California Public Utilities Commission (CPUC)
[†] Senate Bill No. 283, Energy Storage Systems (Clean Energy Safety Act of 2025), Chapter 407, Statutes of 2025, California Legislature

Term	Definition
Battery Energy Storage System (BESS)	An integrated system comprising rechargeable batteries and associated control and power conversion systems, designed to store electrical energy for later use. **For the purposes of this guide, a facility refers to Energy Storage Systems rated greater than 1 Megawatt (MW).*
Battery Management System (BMS)	An electronic system that protects energy storage systems from operating outside their safe operating parameters and disconnects electrical power to the energy storage system or places it in a safe condition if potentially hazardous temperatures or other conditions are detected.
California Public Utilities Commission (CPUC)	A state regulatory body tasked with ensuring the safety, reliability, and fairness of utility services across California.
Cell	The basic electrochemical unit, characterized by an anode and a cathode, is used to receive, store, and deliver electrical energy.
Conflagration	A fire that spreads from one container or module to adjacent ones, resulting in a large-scale fire within the facility.
Contaminants of Concern (COC)	Specific hazardous substances identified at a site that pose a potential risk to human health, safety, or the environment.
Deflagration	The rapid combustion or explosion contained within a single battery container or module, often caused by thermal runaway and can lead to conflagration.
Emergency Action Plan (EAP)	A site-specific document defining the procedures, responsibilities, and resources needed to prepare for and respond to emergencies at a facility.
Emergency Planning Zones	Designated geographic areas established around a facility to guide emergency planning and response, with their size and shape tailored to site-specific hazards and geographic features.
Energy Storage System (ESS)	One or more devices, assembled together, capable of converting and storing chemical energy to electrical energy and vice versa for future use.
Hazard Mitigation Analysis (HMA)	An evaluation of potential energy storage system failure modes and the safety related consequences attributed to the failures.
Hazardous Material Business Plan (HMBP)	A compliance document that details the types, amounts, and storage locations of hazardous materials at a facility.
Independent System Operator (ISO)	An independent organization responsible for electric grid operations, facilitating electricity markets, and planning the bulk electric system within a defined region.
Incident Command Post (ICP)	A designated location for the incident commander and incident management staff coordinate response operations.
Megawatt-Hours (MWh)	A unit of energy equal to one megawatt of power sustained for one hour, representing the total amount of electricity generated or consumed over time.
Megawatts (MW)	A unit of power equal to one million watts, representing the rate at which electricity is generated or consumed at a given moment.
Off-Gassing	The event in which the cell case vents due to a rise in internal pressure of the cell.
Protective Action	A measure taken to safeguard people, property, or the environment from the effects of an incident or hazardous condition.

Term	Definition
Protective Action Zone (PAZ)	A designated geographic area within an Emergency Planning Zone where protective measures such as evacuation, shelter-in-place, or restricted access are implemented to reduce the risk to people from an incident.
Public Education Zone (PEZ)	A designated geographic area within an Emergency Planning Zone where preparedness, awareness, and outreach efforts are focused to help the community understand hazards and how to respond.
Thermal Runaway	The self-heating of an electrochemical system in an uncontrollable fashion.

1.5 BESS Facility Hazards and Risks

While BESS facilities are a critical energy resource, they introduce new and evolving public health and safety challenges. Potential hazards at BESS facilities include hazardous materials releases, fires, or system failures with potential off-site impacts. Thermal runaway occurs when excessive heat caused by overcharging, physical damage, internal short circuits, or other failures triggers a battery's internal components to break down chemically. For instance, when lithium-ion cells enter an uncontrollable, self-heating state, heat is generated at a rate several times higher than the rate at which it dissipates from the cell. This breakdown releases more heat, which further accelerates the chemical reaction, often releasing flammable gases, fire, or toxic smoke.

The gases that are released from battery energy storage systems are highly flammable and toxic. The type of gas released depends on the battery chemistry involved but typically includes toxic gases such as hydrogen fluoride (HF), carbon monoxide, carbon dioxide, hydrogen, methane, ethane, and volatile organic compounds. These gases have the potential to combine with oxygen and form an explosive mixture. There are substantial safety risks associated with certain gases emitted from batteries, like hydrogen fluoride. Battery fires are difficult to extinguish, can reignite after appearing to be under control, and may involve intense heat and rapid flame spread. The high-voltage nature of these systems also introduces significant electrical hazards, including shock, arc flash, and equipment failure risks, particularly during maintenance or emergency shutdowns.

1.6 Lessons Learned

The evolution of BESS facilities has been accompanied by increasing awareness of their unique safety risks. Notable fires in Moss Landing, California have highlighted challenges related to heat management, cascading cell failures, and emergency response coordination. The Moss Landing Energy Storage Facility, located at the intersection of Highway 1 and Dolan Road in Moss Landing, is owned and operated by Moss Landing Power Company, LLC, a subsidiary of Vistra Energy (Vistra). The Moss Landing Energy Storage Facility, one of the world’s largest, had a capacity of 750 MW/3,000 MWh. Adjacent to the Moss Landing Energy Storage Facility, at the Moss Landing Electric Substation, the Elkhorn BESS, owned and operated by Pacific Gas and Electric Company (PG&E). The Elkhorn BESS has a capacity of 182.5 MW/ 730- MWh and utilizes Tesla Megapacks, which are maintained by Tesla under contract with PG&E. Since 2021, multiple incidents BESS incidents in Moss Landing have caused fires, evacuations, and shelter-in-place orders for nearby residents.

The following BESS-related incidents have been recorded since 2021:

- September 4, 2021, Vistra Battery Energy Storage Facility
- February 13, 2022, Vistra Battery Energy Storage Facility
- September 20, 2022, PG&E Elkhorn Battery Energy Storage Facility
- January 16, 2025, Vistra Battery Energy Storage Facility

Hazardous Materials, Environmental Monitoring, and Real-Time Situational Modeling: Battery fires should be treated as a hazardous materials incident. Early deployment of hazardous materials teams has proven essential for effective incident management. Equally important is the rapid deployment or pre-existing on-site availability of air monitoring resources, supported by plume modeling is critical to assessing the situation and evaluating risks in real-time. Environmental protection should be considered early in an incident. Water and air monitoring should be maintained throughout the incident. Water testing should be ongoing, and results require processing time. Plans need to be in place to control, and test run off prior to release. A significant gap has been identified in the availability of pre-existing soil sampling baseline data, which is crucial for contextualizing post incident sampling data. The volume of raw data generated during incidents has presented challenges for timely analysis and decision-making, demonstrating the necessity for streamlined data management and interpretation tools.

Clear Understanding of Risks, Impacts, and Protective Actions: Clear communication with the public is vital during incidents at BESS facilities, as complex technical terminology frequently creates confusion. It is essential that public officials are equipped with plain, accurate language to explain risks and protective actions in a way the general public can understand. A significant challenge has been the limited guidance and information provided by facility operators, which has left public safety officials without sufficient insight to provide clear directions and recommendations to protect public health and safety. During multiple incidents, road closures, evacuations, shelter-in-place orders were issued to varying degrees. Clear triggers and data for implementing and lifting these orders was not always readily available. This challenge is further complicated by the limited understanding of the full range of risks associated with chemical releases and fires at BESS sites, highlighting the urgent need for enhanced health guidance and further research. Facility operators should clearly identify the targeted exposure gases and related airborne contaminants for measurement purposes, as well as the necessary data needed to effectively evaluate airborne exposures to the facility and neighboring vicinity during an incident. In addition, thresholds should be established for each targeted exposure. Targeted exposure data developed beforehand might be employed in modeling software that could provide further clarity for emergency response decision making.

Evacuation and Emergency Pre-Planning: Traditional wildfire evacuation zones have proven inadequate for hazardous materials incidents. Wildfire zones tend to be geographically irregular and are generally based on topography and road access for safe evacuation. Using the wildfire zones during incidents at Moss Landing BESS proved to be ineffective and confusing for the public as these zones do not reflect how hazardous materials actually spread. While wildfires tend to follow terrain and vegetation, hazmat threats, especially chemical gases, spread based on different factors, such as wind direction, gas density, temperature, and the specific properties of the substance. Additionally, wildfire zones are designed with evacuation in mind, while in many hazardous materials incidents, the best course of action for people in the affected area is to shelter in place, not evacuate. Challenges using wildfire evacuation zones during these incidents has emphasized the need for planning frameworks tailored to these types of risks. Additionally, previous incidents have highlighted the importance of having multiple pre-identified incident command post locations that are safely distanced and accessible. Pre-planning and familiarity with the facility by first responders is critical to understanding the hazards and potential in the beginning stages of the incident. Establishing strong communication and collaboration with first responders and emergency management before and during an incident is essential in improving overall response outcomes. Effective emergency response planning, as well as training and exercising the plan is essential to ensure familiarity with the facility and associated risks and hazards.

2 Emergency Action Planning

2.1 Planning Process

ISOs are responsible for developing, updating, and maintaining a site-specific EAP that reflects the unique characteristics of their facility and operations. The recommended planning process offers a structured approach to build readiness, support interagency coordination, and promote an effective response. This guidance is not prescriptive but serves as a baseline to ensure critical elements are considered in developing a comprehensive BESS EAP.

1. **Risk Assessment and Hazard Identification:** Evaluate potential hazards related to BESS, including thermal runaway, fire, explosion, toxic gas release, and electrical hazards. Identify site-specific risks based on system size, chemistry, layout, and proximity to communities or sensitive environments.
2. **Stakeholder Engagement and Roles Definition:** Engage local emergency responders, community representatives, utility partners, regulators, public health officials, and environmental agencies. Define roles and responsibilities for each stakeholder during an incident, including command structure, communication protocols, and resource sharing.
3. **Develop Site-Specific Emergency Scenarios:** Create a range of credible emergency scenarios (e.g., internal fire, gas release, etc.). Simulate potential outcomes using tools like plume dispersion modeling and fire behavior analysis.
4. **Establish Notification and Communication Protocols:** Develop a clear notification chain for internal teams, public safety agencies, and communities. Implement redundant communication methods to maintain contact during power outages or equipment failures.
5. **Emergency Response Procedures:** Develop step-by-step procedures for responding to each scenario, including shutdown protocols, fire suppression tactics, real-time air monitoring and evacuation criteria. Include procedures for personnel safety, system isolation, and hazard containment.
6. **Environmental Monitoring and Sampling Plan:** Establish an off-site environmental monitoring plan that conducts baseline sampling of air, soil, and water to document pre-incident conditions. The plan must also include sampling protocols for implementation during and after an incident to assess impacts.
7. **Documentation and Compliance:** Ensure the EAP aligns with local, state, and federal regulations. Maintain accessible documentation for inspections, audits, and after-action reviews.
8. **County Submission and Review:** Submit the draft EAP and additional relevant documentation to the local authority and regulatory agencies for review and feedback. Incorporate stakeholder input to enhance public trust, support coordinated response and meet local compliance expectations.
9. **Training and Drills:** Conduct regular training and exercises with first responders and facility staff. Include tabletop exercises and full-scale drills to test the effectiveness of the EAP under realistic conditions.
10. **Continuous Review and Improvement:** Update the EAP annually or after any incident, drill, or regulatory change. Update notification lists regularly. Incorporate lessons learned and new technologies or mitigation measures to improve safety and response.

2.1.1 Planning Team

When building the planning team, ISOs may begin with their existing organizational structure. A planning team that oversees the comprehensive plan or addresses issues related to the built environment, operations, engineering, hazardous materials, battery manufacturer, employee safety, risk management, and community relations/public affairs creates a robust foundation for planning. The ISO should specify an EAP Coordinator who will be responsible for overall management, maintenance and coordination of EAP- related activities. This individual serves as the primary point of contact for all matters related to the EAP and should be authorized to oversee both routine and emergency activities associated with the plan.

The ISO should develop the EAP in close coordination with public safety authorities and applicable regulatory agencies to ensure the plan is aligned with operational needs and regulatory expectations. Plans developed in isolation from these stakeholders often fall short of what is needed to support real-time decision-making and operational coordination during an emergency. Including appropriate stakeholders in the development of the EAP will enhance confidence in the EAP and its accuracy. Coordination will provide opportunities to discuss critical emergency planning concerns such as the order of public official notification, use of backup personnel, alternate means of communication, and special procedures for nighttime, holidays, and weekends.

2.1.2 Community Outreach and Public Awareness

BESS facilities located near populated communities, protected natural areas, critical infrastructure, or transportation corridors present unique operational and public safety challenges. The ISO should actively participate in a coordinated, horizontally integrated approach to develop public awareness initiatives and emergency communication planning. Together with emergency management authorities and regulatory agencies, the ISO should develop initiatives that clearly communicate the location and potential hazards of the facility, how the public will be notified in the event of an emergency, and what protective actions they may be advised to take. Communication strategies should incorporate multiple channels such as, integrated alerting systems and social media, to ensure accurate, timely and accessible information reaches all potentially affected populations.

2.2 Emergency Action Plan Contents

The EAP is a formal document that identifies potential emergency conditions at a BESS facility and specifies actions to be followed to minimize loss of life and property damage. The EAP should be site-specific, as operational conditions, facility layout, and surrounding land use may vary between sites. The ISO should ensure all key elements of BESS emergency planning outlined below are addressed. An EAP Review Checklist is included in **Appendix A: EAP Review Check List.**

2.2.1 Facility Overview

The plan should include a description of the BESS facility, its name, location, purpose, owner, and operator. The facility overview should describe the technical specifications of the system, including the system's power rating in megawatts (MW), energy storage capacity in megawatt-hours (MWh), the system's storage duration, the number of containers or racks used in the installation, and the battery manufacturer and model. Information about the cooling system, fire detection and suppression system, and any enclosures should also be included. It should also include description of the site itself, with the total land area, the proximity to substations or generation assets, along with details on access roads, fencing, security features, and any other site infrastructure relevant to operations and safety. A vicinity map of the BESS facility and a simple site layout are recommended. To support emergency planning, it is recommended that the facility overview also addresses environmental and geographical factors that may influence emergency response operations. This includes the availability and location of water supplies, access and egress routes, and any bordering major transportation corridors or residential areas. The presence of vulnerable infrastructure and populations in proximity to the facility should be identified, along with any floodplain designations or adjacent environmentally sensitive areas.

2.2.2 Roles and Responsibilities

The EAP should clearly delineate the responsibilities of all those involved in managing an incident or emergency at the facility and how the responsibilities should be coordinated. The duties of the ISO should be clearly described, and operators should be trained on the importance and use of the plan. In general, the ISO is responsible for detecting and evaluating BESS site safety incidents, classifying the incident, notifying emergency management authorities, and taking appropriate response actions. The chain of command in the ISO's organization should be clearly described. Organization officials and alternates that must be notified should be identified and priority of notification determined. Notification of supervisory personnel is recommended if time permits. Responsibilities should be coordinated with appropriate levels of management to ensure full awareness of organizational capabilities and responsibilities.

2.2.3 Hazard Modeling, Mapping, and Environmental Sampling

The ISO should provide the following models and maps with their EAP, including:

Plume Dispersion Models and Maps: Plume dispersion models are tools used to simulate how airborne pollutants spread in the atmosphere after being released from a source. These are used to estimate the concentration of the released substance at various distances and directions from the source over time. Plume dispersion maps are the visual outputs of plume dispersion models. These maps display how and where a released substance spreads in the air. These analyses are used both by the ISO and first responders to support response decisions by assisting in the assessment of potential health risks and emergency response measures.

Watershed Pollution Maps: Watershed pollution maps are essential for identifying areas at risk of contamination from battery fires, which can release hazardous substances through fire debris, electrolyte leakage, and firefighting water runoff. These maps help track the movement of toxic materials, such as heavy metals, corrosive chemicals, and PAHs, into nearby soil and water systems.

Off-Site Environmental Sampling Map: A sampling location map shall be included as part of the plan specified by **Section 3.3.3**.

Emergency Planning Zone Maps: Emergency Planning Zones should be developed in alignment with Plume Dispersion modeling and incorporated into the EAP. The size and shape of Emergency Planning Zones will vary for each facility due to detailed consideration of the specific site conditions, unique geographical features of the area, and demographic information. The ISO should provide an analysis of potential impacts to the zones and recommended protective actions. These maps, models, and plans are discussed in greater detail in **Section 3** of this Plan.

2.2.4 Incident Detection and Emergency Classification Levels

Early detection and evaluation of the condition(s) or triggering event(s) that initiate or require an emergency response action are crucial. The EAP should clearly address the expected timeframes for detecting abnormal or hazardous conditions, evaluating the severity of the situation, and initiating appropriate emergency notifications. It is essential that the total time from incident detection to emergency classification and notification of responsible entities is evaluated, documented, and well understood by facility personnel. This evaluation should consider factors such as staffing levels, automated monitoring system performance, communication pathways, and the time required for protective actions. Understanding these response timelines is critical when developing preparedness actions and operational procedures to ensure timely and effective implementation of the EAP. The speed of detection, classification, and notification directly influences the ability of emergency response partners to protect public safety, coordinate operational actions, and manage off-site impacts. As such, prompt internal coordination and efficient external communication is essential to an effective emergency response strategy at a BESS facility.

It is important to develop procedures for reliable and timely determination of an emergency level to ensure that the appropriate response actions are taken based on the urgency of the situation. BESS Facilities should utilize an emergency level classification system to support clear, coordinated response actions. This standardized structure will support effective incident assessment, notification, and response coordination with external partners. Consistency of the emergency level categories is recommended to eliminate confusion for emergency responders whose jurisdiction contains multiple BESS facilities.

2.2.5 Notification Procedures

The plan should include procedures the ISO will follow to issue early warning and notification messages to responsible public safety authorities and the surrounding area. The ISO should include a Notification List based on the Emergency Level and procedures for ensuring that public safety authorities are provided with timely and accurate information on conditions during an incident. It is recommended that the ISO promptly notify the affected public when an emergency occurs at a BESS facility. If available, the ISO should leverage their official public information and messaging platforms as a source of public-facing communications originating from the operator during an incident.

2.2.6 Response Procedures

After the initial notifications have been made, the ISO will act to control the incident and minimize impacts to life, property, the environment, and energy system reliability. This step involves a continuous process of implementing response actions, assessing current conditions, and providing updates through the communication channels established during initial notifications. The EAP may go through multiple emergency levels during this phase, depending on whether the situation improves or deteriorates. The plan should also include actions the ISO will take to moderate or alleviate a problem or incident at the BESS facility. If relevant to the facility design, the EAP should outline actions to reduce risk by controlling system conditions.

It is the responsibility of the ISO to develop clear protective action thresholds or triggers as part of the EAP. These thresholds should outline specific operational conditions that would warrant public protective actions, such as shelter-in-place advisories, evacuations, or public health notifications. During EAP development, these protective action thresholds and protocols should be shared with local public safety authorities for review, feedback, and refinement. This collaborative approach ensures that protective action criteria are operationally realistic, aligned with community response capabilities, and meet local emergency management expectations.

2.2.7 Training and Exercise

Training and exercise is essential for ensuring personnel are prepared to effectively implement the EAP. It is advisable that a comprehensive training and exercise program is established by the ISO in coordination with partner agencies identified in the EAP.

2.2.8 Plan Maintenance and Improvement

The EAP should include a strategy for maintaining and updating the plan. Following each exercise or actual emergency, an after-action review should be conducted with all participating agencies to assess what worked well and what needs improvement. The review should address the accuracy of EAP content, such as contact information and maps, as well as the effectiveness of procedures, responsibilities, and resource levels.

2.3 Planning Considerations

2.3.1 National Incident Management System and Incident Command System

The National Incident Management System (NIMS) provides a systematic approach to guide all levels of governmental, nongovernmental, and private-sector organizations to work seamlessly to respond to incidents. The NIMS approach is effective for any situation that involves coordination among multiple agencies or partners. The Incident Command System (ICS) is a fundamental element of NIMS and consists of a standardized, on-scene, all-hazards incident management approach. This system allows for the integration of facilities, equipment, personnel, procedures, and communications within a common organizational structure. It also enables a coordinated response among various jurisdictions and functional agencies, both public and private. Additionally, ICS establishes common processes for planning and managing resources. ICS provides an organizational structure for incident management and guides the process for planning, building, and adapting that structure. It is recommended that ISOs coordinate with appropriate public safety authorities in an effort to incorporate ICS and NIMS concepts and structures into the EAP.

2.3.2 Access to the Site

The EAP should include a clear description of primary and secondary access routes to the BESS facility for emergency responders, operations personnel, and support resources. This should account for access by various means as appropriate to the facility's location and surrounding environment, such as roadways or utility corridors. The plan should also address estimated response times under both normal and adverse conditions, including considerations for potential access restrictions such as wildfire activity, hazardous materials releases, severe weather, or other obstructions. If the primary access route to the facility is vulnerable to disruption (for example, located in a flood-prone area, near a wildfire risk zone, or along a single-entry road), this limitation must be identified in the EAP. In such cases, clearly documented alternate routes or contingency access options should be established to ensure emergency responders can safely reach the site during an incident. These access plans should be reviewed regularly, particularly ahead of severe weather seasons, planned construction projects, or other known events that could impede normal site access.

2.3.3 Response During Off-Hours and Adverse Conditions

The EAP should clearly address response procedures for potential or actual emergency conditions occurring during periods of darkness. This should include any special instructions for the ISO, on-site personnel, and public safety authorities. If response times differ from those expected during daylight hours, those adjustments should be documented in the plan to ensure realistic expectations and operational readiness. The plan should describe actions to ensure adequate lighting for critical areas of the facility, including access points, battery enclosures, electrical control rooms, and ventilation or exhaust systems.

Any procedures that differ during power outages should be detailed, such as the manual operation of electrically powered equipment, activation of backup lighting systems, and additional notification protocols if automated systems are impacted. Alternative sources of power for operations or other emergency needs should be identified in the EAP. The plan should list the location of each alternate power source, its mode of operation and, if portable, a means of transportation with routes to be followed.

The EAP should also address responses during weekends or holidays and include any special instructions for the ISO and/or public safety authorities. Response times, if different from non-holiday or weekdays, should also be included. The availability of the ISO should be considered, and any special procedures for contacting or notifying personnel addressed.

Response under adverse weather conditions should be included and any specific actions to be taken described in detail. Alternative methods of access to the site should be described. The expected response time should be discussed in detail. Any other special instructions for the ISO or public safety authorities should be described.

2.3.4 Emergency Supplies, Equipment, and Stockpiling

Planning and organizational measures that can help the ISO and public safety authorities manage an emergency situation more safely and effectively include stockpiling materials and equipment for emergency use. The availability of local resources should be predetermined through discussions with local public safety authorities and additional resource needs should be identified.

The EAP should document materials, equipment, and resources that may be needed for emergency response, facility repair, or containment activities. This includes identifying the type and quantity of materials required for anticipated scenarios, the location of those supplies, and details on how they will be accessed and deployed. Equipment necessary for emergency operations, such as portable lighting, ventilation equipment, spill containment kits, fire suppression tools, and gas monitoring devices, should be listed along with their storage locations and designated operators. The plan should identify local contractors, vendors, and suppliers capable of providing specialized equipment or materials to support BESS-specific incidents. Contact information, service availability, and directions to their locations should be included to expedite resource requests during emergencies. If stockpiling certain materials or equipment on-site is not necessary, a clear justification should be provided in the EAP along with procedures to quickly acquire those resources if needed.

3 Modeling, Mapping, and Sampling

3.1 Plume Dispersion Models and Maps

The primary purpose of plume modeling and mapping is to accurately depict toxic off-gassing and potential downwind impacts of a BESS facility emergency. The ISO should develop modeling in coordination with the appropriate public health, hazardous materials, and public safety stakeholders. The purpose of coordination is to ensure that authorities understand how to interpret the maps and that the maps contain sufficient and current information for authorities to warn and evacuate people at risk from a BESS facility incident. Plume modeling studies should be prepared by a licensed California Fire Protection Engineer to ensure thorough and accurate safety assessments.

To ensure the plume modeling reflects a realistic range of potential impacts, it is recommended that multiple scenarios be evaluated using a sensitivity analysis. A variety of factors must be evaluated to support the development of realistic scenarios, including the battery manufacturer, installation specifics, facility location, existing mitigation measures, and potential failure mechanisms. It is recommended that a variety of variable conditions are considered, such as variations in seasonal conditions, such as representative summer and winter weather patterns, as well as differences in failure size and system charge levels. It is best practice to utilize the most accurate available topographic data to produce realistic volume and routing estimates. A key consideration in any analysis is determining the appropriate level of conservatism when selecting input values, such as the emission rates, and designing scenarios. The degree of conservatism may vary depending on specific regulatory or permitting requirements or advances in BESS modeling research.

3.1.1 Model Characteristics

To simulate the battery fire dispersion, a number of meteorological and chemical variables are required. Depending on the sophistication of the model used, these include:

Meteorological

- Wind speed and prevailing direction
- Inversion layer
- Temperature
- Humidity
- Rainfall rates
- Stability or turbulence profiles

Chemical

- Chemical composition and characteristics (e.g., concentration, density, thermodynamic properties)
- Explosion parameters (e.g., estimates of heat release rate and total released heat)

Desired Capabilities

- Ability to model gaseous and particulate matter (PM) plumes (e.g., combustion) and dense gas plumes (e.g., off-gassing plume)
- Ability to model buoyant plumes (e.g., combustion or otherwise heated plume)
- Ability to model explosions
- Ability to model industrial applications
- Incorporates complex terrain, including nearly building structures
- Incorporates changes in meteorology parameters
- Outputs averaging times in seconds/minutes
- Fast setup and run time, reduced complexity

3.1.2 Model Input Selection

Key inputs for plume modeling also include the quantity of battery inventory at various stages of a battery event, such as pre-combustion-off-gassing, combustion, and suppression, the timing and severity of failure, and prevailing weather conditions. The resulting plume model maps are intended to serve as a critical tool to inform protective actions for site personnel and the surrounding communities. Key information needs on BESS design and site locations that impact final concentration estimates include the following:

1. Total battery weight (kg) and storage capacity (kWh) for estimating heat release and pollutant emissions
2. BESS dimensions for initial source size inputs
3. Number of modules to which thermal runaway might propagate (aka propagation cycles) during an event
4. Presence/location of ventilation ports (e.g., vent piping, deflagration panels), understanding of ventilation type (e.g., active/passive, deflagration-based)
5. Heights and dimensions of all nearby structures that can block the winds as well as major topography (e.g., located in a valley), and landscape type (e.g., forested, agricultural)
6. Locations of nearest off-site human populations and sensitive groups
7. Battery chemistry (This is helpful, but as the range of emissions for batteries of similar chemistry are large and overlap with those from other chemistries, this may not be the driving factor in the results), and
8. Battery state-of-charge (SOC) (Higher SOC values are more likely to result in flaming combustion, which lofts and dilutes the combustion plume and subsequent reduces near-surface concentrations as compared to low SOC cases. Low SOC cases are more likely to result in dense off-gassing plumes of volatilized electrolyte that hug the ground surface, look like white fog, and increase estimated concentrations as compared to high SOC scenarios).
9. Emission rates
10. Heat release rates and temperatures of off-gas or combustion plume
11. Minimum wind speed

3.1.3 Scenarios

Selection of fire scenarios to be modeled will depend on the primary question being asked and potential human receptors of interest. At a minimum, concentrations should be calculated at 2 meters and 1 meter above ground level height, as these bound typical human breathing heights. Concentrations at breathing heights can be lower than surface concentrations for dense gas thermal runaway events. Vertical profiles of the plume with additional points can be helpful in understanding exposure to people in closely sited multi-story buildings. First responders may be more interested in the maximum distance away from the site at which concentrations can exceed health criteria than the exact concentration maps. This is easier to communicate, to use for decision-making, and to enforce for any evacuation and shelter-in-place orders. Depending on emissions assumptions, HCl may be a larger health concern than HF for the combustion case. While the relevant health criteria (IDLH, AEGL) for HCl are higher than for HF, the larger emissions of HCl often lead to more exceedances of the health criteria. Any conditions resulting in concentrations protective of human health for HCl and HF is likely protective for all other pollutants of interest.

The scenarios may address the multiple phases of battery fire events described below. In order to consider the variations of each phase, the ISO should consider modeling each of the below phase’s impact to 1%, 5%, 10%, 15%, 25%, 50%, 75%, 85% and 90% of the battery inventory for five exposure periods for 10 minutes, 30 minutes, 60 minutes, 4 hours, and 8 hours.

1. Pre-Combustion (Off-Gassing) Phase

In the first phase, the pre-combustion or incipient phase, a large amount of gas is released from the batteries for a period of seconds (one battery cell) to minutes (one module). This precombustion phase has the highest total gas release rate. Even if ventilated from a container, the gases released may not be well-mixed with air, and so the density of the released gases needs to be accounted for. This would require a model that handles dense gas plumes and industrial applications. This phase lasts seconds to minutes, or hours if a fire does not initiate. An increasingly common fire management approach is to keep the system in a pre-combustion stage while cooling, as NFPA-69 Standard on Explosion Prevention Systems compliant mechanical exhaust systems are designed to vent off gas before ignition.

2. Combustion Phase

In the second phase, the combustion phase, the gases ignite, leading to an explosion and battery fire. This phase can last hours. The combustion removes a large amount of the gases released, and the process of burning mixes them with air such that dense gas effects can be neglected, but the buoyancy of the hot smoke needs to be accounted for. This requires a model that can account for buoyant plumes, such as a smokestack or plume/puff model.

3. Suppression Phase

In the final phase, the suppression phase, water and/or chemical agents are used by firefighters to stop the combustion, but the heat release from the batteries continues; again, buoyant plume models are required. In this phase the gas emission rates are lower than in the first phase but are not removed by combustion and the exposure of firefighters near the source becomes a concern. In this phase, dense gas and buoyancy may both need to be incorporated. Water mist through rainfall or applied spray can substantially reduce concentrations of gases and particles through entrainment and dissolution.

3.2 Watershed Pollution Maps

To prepare watershed pollution maps related to battery fire hazards, define the area of interest, including potential fire sites and the surrounding watersheds that could be affected by runoff and debris. Gather foundational spatial and environmental data, including topographic maps, watershed boundaries, hydrological features, and land use information from authoritative sources. Utilize Digital Elevation Models to conduct hydrological modeling that simulates surface water flow from the battery facility across the landscape. This analysis is essential for identifying potential pollutant transport pathways and determining areas where contaminants may accumulate or discharge in nearby water bodies. Overlay additional risk assessment layers, such as soil type, erosion potential, and the presence of sensitive environmental receptors, including wetlands, drinking water sources, and aquatic habitats.

To enhance the accuracy and reliability of these maps and models, incorporate field-verified data such as water and soil sample results, as well as existing environmental monitoring datasets. Integrating real-world contamination measurements supports a more precise and comprehensive understanding of current environmental conditions and potential impacts associated with battery fire incidents. When developing watershed pollution maps related to battery fire hazards, several model variables are critical for accurately assessing pollutant transport and environmental risk.

3.3 Off-Site Environmental Sampling

ISOs shall prepare an environmental sampling plan and corresponding sample collection protocols to: 1) establish an environmental baseline; and 2) facilitate timely and effective sampling and data gathering after an incident occurs. The collection of baseline samples within 12 hours from the onset of a BESS facility incident is strongly recommended, as these data provide essential reference points for subsequent environmental monitoring and impact assessment. Creating a baseline is critical for assessing the scope of environmental impact following an incident and additionally informs appropriate recovery and remediation actions.

The sampling plan should identify key locations within the facility, along the facility perimeter and in surrounding areas outside of the facility site. The types of media to be collected (soil, water, air), frequency, and methods shall be specified to ensure consistency and reliability between baseline and post-incident assessments. ISOs will submit initial proof of sample collection to demonstrate readiness and transparency in environmental stewardship.

3.3.1 Contaminants of Concern and Screening

Criteria for Contaminants of concern (COCs) should include metals representative of chemicals in the specific type(s) of batteries that will be utilized on site. For example, at minimum, a facility with Nickel, Manganese, Cobalt (NMC) batteries would include:

- Cobalt
- Aluminum
- Copper
- Lithium
- Manganese
- Nickel
- Lead
- pH

Locations where visible ash or debris are reported post-incident should also be evaluated for PAHs, dioxins, and furans.

3.3.2 Sampling Locations

Sample locations should be identified based on potential release mechanisms (i.e. smoke, run-off water), pathways for contamination (i.e. air transport, stormwater outlets) and proximity to sensitive receptors.

- **Immediate site & fence line:** Collect composite surface soil samples every 250–500 feet along the perimeter, with higher density downwind of the fire plume or in depositional areas.
- **Near-community band (0–1 mile):** 2–4 soil samples per square mile, targeted to sensitive receptors
- **Broader community (>1 mile):** Lower density, 1–2 soil samples per square mile, focused on depositional zones identified by modeling or visual ash fall.
- **Background sites:** At least 1–2 upwind/out-of-plume reference soils, ideally in areas with similar land use/soil type.

Examples of sensitive receptors include but are not limited to the following:

- Agricultural fields
- Health Care Facilities
- Parks/Recreational Areas
- Residential neighborhoods
- Schools
- Water sources/ water bodies
- Wells

A sampling location map shall be included as part of the sampling plan. The map must show all proposed sample points, nearby sensitive receptors (e.g., residences, schools, surface water bodies), and access routes.

3.3.3 Sampling Protocols

To ensure consistency and comparability of data, soil sampling shall be conducted according to the following protocols:

- **Sample Depths**: Collect one sample at the ground surface (0–0.5 inches) by scraping away loose debris and vegetation. Collect a second sample at a depth of approximately 3 inches below grade.
- **Sample Collection Procedures**: Use clean, decontaminated equipment for each sample location. Remove surface debris (leaves, gravel, organic matter) prior to collecting the ground surface scrape. Place each discrete sample into a clean, laboratory-supplied container. Label samples clearly with location, depth, and date/time of collection.
- **Quality Assurance/Quality Control (QA/QC):** Follow U.S. EPA-approved analytical methods appropriate for target analytes. Include field blanks, duplicates, and equipment rinsate samples at a minimum frequency of 10% of total samples.
- **Timing of Post-Incident Sampling**: Post-incident sampling shall be initiated as soon as possible following the incident and no later than seven (7) days afterward, provided the area has been declared safe for entry by the Incident Commander.

3.3.4 Screening Levels

Screening levels established by the California Department of Toxic Substances Control (DTSC) and/or US Environmental Protection Agency (EPA) are risk-based concentrations of chemicals in environmental media (soil, air, water) below which no appreciable risk of adverse health effects in expected, can be analyzed by US EPA-approved analytical methods.

COC concentration data should be screened against the following criteria, listed below in order of priority:

- DTSC-modified screening levels[*]
- If no DTSC screening level is promulgated for a compound, the US EPA's Regional Screening Levels (at a target cancer risk level of 1x10-6 and noncancer hazard quotient of 1) should be used[†]
- Dioxin and dioxin-like compounds will be evaluated using Toxic Equivalency Factors for residential soil[‡]

If no screening level is available from DTSC or the US EPA, the ISO shall propose a scientifically justified screening level for the compound, subject to review and approval by DTSC.

Air

- Office of Environmental Health Hazard Assessment (OEHHA) Reference Exposure Level (REL)
- Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs)
- DTSC-modified screening levels
- US EPA's Regional Screening Levels

Water

- California Water Board Tier 1 Environmental Screening Level (ESL) for Groundwater

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[*] DTSC Human and Ecological Risk Office (HERO), Human Health Risk Assessment Note 3 – DTSC-modified Screening Levels (rev. April 2025)

[†] US EPA Regional Screening Levels (November 2024)

[‡] DTSC Human and Ecological Risk Office (HERO), Human Health Risk Assessment Note 2 – Dioxin (April 2017)

- DTSC-modified screening levels
- US EPA's Regional Screening Levels

3.4 Emergency Planning Zones

The ISO should develop Emergency Planning Zones and incorporate them into the EAP. The size and shape of Emergency Planning Zones will vary for each facility due to detailed consideration of the specific site conditions, unique geographical features of the area, and demographic information. Emergency Planning Zones help organize emergency planning and response actions into areas that are familiar to emergency response agencies and the public. The ISO should cross reference Emergency Planning Zones and plume modeling to provide an analysis of potential impacts to the zones and recommended protective actions. This analysis should prioritize a conservative approach to protecting life and environment based on most impactful scenario outcomes. Emergency Planning Zones should be broken into Protective Action Zones (PAZs) and Public Education Zones (PEZs). An example of Emergency Planning Zones for the Moss Landing BESS Facility is included in **Appendix B: Moss Landing BESS Emergency Planning Zones**.

3.4.1 Protective Action Zones (PAZ)

A Protective Action Zone (PAZ) is a designated area where protective measures, like evacuation or sheltering, may implemented to safeguard the public from potential exposure to hazardous materials. PAZs are not and should be used synonymously with Hot Zones and Warm Zones. Protective action zones should be immediately adjacent and downwind from the incident and is a radius zone surrounding the hazard in all directions. Protective action distances should be based on plume dispersion modeling/mapping and recommendations from the Department of Transportation Emergency Response Guide.

3.4.2 Public Education Zones (PEZ)

Public Education Zones (PEZ) are areas where residents are not expected to be directly affected by an incident at a BESS facility. However, because these zones are located near the facility and just outside the PAZs, residents may still experience concern, misinformation, or indirect impacts such as traffic disruptions. PEZ boundaries are typically based on factors such as proximity to the BESS facility, transportation routes, and the potential for public interest or confusion during an incident. These zones help guide outreach and education efforts, ensuring that residents in nearby communities receive basic information about the facility, its potential hazards, and where to find accurate updates during an incident. Providing clear and proactive public education within the PEZ supports transparency, promotes community preparedness, and reduces the risk of misinformation during emergencies.

4 Response

There are generally five steps that should be followed when an unusual or emergency incident is detected at a BESS site. These steps constitute the EAP response process:

Step 1 Incident Detection
Step 2 Incident Evaluation and Emergency Level Determination
Step 3 Notification and Communication
Step 4 Emergency and Protective Actions
Step 5 Termination and Follow-Up

4.1 Incident Detection

Prompt detection, evaluation, and reporting of abnormal conditions are essential to maintaining operational safety and initiating timely emergency response. Unusual conditions or incidents are unique to each facility and, to the extent possible, should be identified in the EAP. The EAP should outline provisions for surveillance and monitoring of critical systems, environmental conditions, and potential hazards. The following information should be considered for inclusion or reference in the plan to assist the ISO in incident detection:

- Implement and maintain detection systems for potential system failures, abnormal operations, and hazardous conditions, including thermal runaway, off-gassing, electrical faults, fire, and smoke within battery enclosures, inverters, and related equipment.
- Ensure thermal monitoring systems track key parameters such as state of charge, voltage, current, gas levels, and temperature rises to promptly identify abnormal conditions.
- Integrate fire and smoke detection systems with fire suppression, facility alarm, and telemetry systems, ensuring continuous alarm notification linked to a 24/7 operations center or designated on-call personnel.
- Deploy automated alarms and real-time remote monitoring with clearly defined thresholds and escalation procedures for operational anomalies, equipment malfunctions, and loss of critical functions.
- Establish clear protocols for analyzing, verifying, and responding to incoming data or alarms, including coordination with the facility control center and local first responders.
- Document all monitoring, detection, and alarm systems in use, including fire, smoke, thermal sensors, gas monitors, and video surveillance, especially for unattended periods.
- Develop and enforce inspection and preventive maintenance procedures for battery enclosures, electrical systems, HVAC, and fire suppression equipment to ensure ongoing reliability.

4.2 Incident Evaluation and Emergency Level Determination

After an unusual condition or incident is detected and confirmed, the ISO will categorize the condition of incident into one of the established emergency levels based on the severity of the initiating condition or triggering events. Emergency levels are predefined classifications used to describe the severity of an incident, ranging from minor events with no off-site impact to major emergencies requiring multi-agency response and public protective actions. BESS Facilities should utilize an emergency level classification system to support clear, coordinated response actions. This standardized structure will support effective incident assessment, notification, and response coordination with external partners. Consistency of the emergency level categories is recommended to eliminate confusion for emergency responders whose jurisdiction contains multiple BESS facilities. Both the ISO and public safety authorities should understand the emergency levels and each other's expected responses. The four emergency levels for BESS facilities are included in **Table 2.**

Table 2: BESS Facility Emergency Levels

Level	Impact and Action	Description	Example Incidents
Level 0	**On-Site Only** *Notification Only*	An event involving a minor equipment malfunction with no impact to safety or operations but warrants documentation.	• Coolant Leak • Abnormal readings requiring monitoring
Level 1	**On-Site with Possible Off-Site** *Awareness Messaging*	An event with potential safety or operational impacts, requiring increased readiness and coordination with public safety.	• Loss of primary systems with backups operational • Abnormal readings requiring enhanced monitoring
Level 2	**Minor Off-Site Impact** *Public Health Advisory*	A serious incident impacting facility operations and on-site personnel, with **potential** for off-site impacts and consequences.	• Partial battery system loss with potential off-site impact • Fire, spill, or system failure impacting critical systems
Level 3	**Off-Site Impact** *Public Protective Actions*	A severe incident with substantial impacts to facility operations and/or off-site areas, requiring immediate protective actions, multi-agency coordination, and rapid mobilization of on-site and emergency resources.	• Thermal runaway, large fire, or explosion • Structural failure or severe operational degradation • Uncontrolled release requiring public protective actions

Information to assist the ISO in determining the appropriate emergency level should be developed and included in the EAP. A guidance table for determining the emergency level for different incidents is included in **Appendix C: Guidance Table for Determining Emergency Level.** The EAP should describe how each emergency level applies to the particular facility, this includes:

- Common triggers for each Emergency Level and associated operational indicators, such as system status, alarm types, sensor readings, and containment performance
- Recommended follow-up actions or increased monitoring intervals
- Required notification recipients based on incident type and severity
- Criteria for escalation to higher emergency levels
- Immediate response actions, such as protective measures, monitoring requirements, on-site evacuation procedures, public protective actions, and multi-agency response coordination requirements

4.2.1 Emergency Level 0

The Level 0 emergency level indicates that an abnormal or unexpected condition has occurred at the BESS facility that has no immediate impact on public health, safety, or facility operations, but warrants documentation, increased monitoring, and internal notification. This classification provides a mechanism for recognizing and documenting minor events that do not impact safety or operations but require ongoing monitoring. Although a Level Zero does not require immediate public protective actions or off-site emergency response, notifications should be predetermined and documented to maintain situational awareness among key facility and response personnel. Typical triggers for a Level 0 include, but are not limited to:

- Minor coolant leaks within equipment enclosures or battery containers
- Non-critical equipment malfunctions not affecting overall facility safety or energy storage capacity

- Abnormal system readings, such as temperature, voltage, or gas detection alarms, which remain within operational thresholds but require investigation

4.2.2 Emergency Level 1

The Level 1 emergency level is appropriate for an event at a BESS facility that, by itself, does not present an immediate risk of failure or off-site hazard, but does have potential safety or operational impacts which require investigation, heightened awareness, and increased monitoring. This classification is used to recognize and document events that, while not posing an immediate risk to public safety, could affect facility safety or reliability if not addressed. Typical triggers for a Level 1 can include, but are not limited to:

- Loss of primary operational or safety systems, with backup systems still functional
- Presence of unauthorized personnel within restricted operational areas
- Abnormal readings (temperature, voltage, or off-gassing alarms) requiring operational adjustments and enhanced monitoring
- Malfunction of critical infrastructure systems, such as HVAC, fire suppression, or monitoring systems, affecting facility redundancy or control margins

4.2.3 Emergency Level 2

The Level 2 emergency level is used for serious incidents that significantly impact facility operations and on-site personnel and have the **potential** for off-site consequences. These events typically involve degradation of critical safety systems, reduction of operational control, or hazardous conditions that could affect surrounding areas if conditions worsen. They require immediate investigation, on-site emergency response actions, and rapid internal and external notifications. Typical triggers for a Level 2 event can include, but are not limited to:

- Fire, spill, or system failure affecting critical safety or control systems
- Partial battery system loss with potential off-site impact
- Failure of multiple backup systems affecting operational safety margins

4.2.4 Emergency Level 3

The Level 3 emergency level is reserved for severe incidents that cause substantial impacts to facility operations and/or off-site areas. These events involve serious hazards with actual or likely consequences beyond facility boundaries, requiring immediate protective actions, multi-agency coordination, and rapid mobilization of on-site and external emergency resources. Incidents at this level may directly threaten public safety, environmental conditions, or critical infrastructure, and demand a comprehensive, coordinated emergency response effort. Typical triggers for a Level 3 event can include, but are not limited to:

- Thermal Runaway, large fire, explosion, or hazardous materials release with likely off-site consequences
- Structural failure or severe degradation of operational systems affecting energy storage integrity
- Multi-casualty incident involving facility staff or emergency responders

4.3 Notification and Communication

4.3.1 Public Safety Partners Notification List

Under the EAP, the ISO is responsible for notifying the appropriate public safety authority when an incident is anticipated, is imminent, or has occurred. The EAP should include a Notification List which identifies public safety officials and agencies are to be notified of a BESS site safety incident. The Notification List is critical for the timely notification of those responsible for taking emergency actions and should be tailored to the needs and notification priorities of each BESS facility. The Notification List should clearly identify relevant regulatory and response partner agencies. These agencies may include local fire departments, hazardous materials teams, emergency medical services, environmental health departments, and utility grid operators. The Notification List should include appropriate contact information such as names, positions, telephone numbers, and radio call numbers. It should include multiple communication methods for each contact, where possible, and be securely stored in both electronic and hard-copy formats at key operational locations. Including secondary or backup points of contact for critical positions is encouraged to provide redundancy.

The Notification List should designate who the ISO will contact based on the emergency level. **Table 3** outlines recommendations of which entities should be included on the Notification List based on the Emergency Level.

Table 3: BESS Facility Notification List Recommendations by Emergency Level

Emergency Level 0	Emergency Level 1
• On-Site leadership • Designated company operations or safety management contacts • Regulatory agencies or utility/grid partners, if applicable under permit or operational agreements	• On-Site leadership • Designated company operations or safety management contacts • Applicable regulatory agencies • Utility and grid partners • Local First Responders such as police or fire • 911 Dispatch Center
Emergency Level 2	**Emergency Level 3**
• On-site leadership and facility emergency response team • Designated company operations, safety, and executive leadership • 911 Dispatch Center • Local Emergency Management • Utility and grid partners • Applicable regulatory agencies • Local fire and hazardous materials response agencies • Local Law Enforcement • National Weather Service (NWS) Local Weather Forecast Office • Local environmental health agencies	• On-site leadership and facility emergency response team • Designated company operations, safety, and executive leadership • Local Emergency Management • 911 Dispatch Center • Local fire, hazardous materials response, and law enforcement agencies • Local public health authorities • Local environmental health agencies • Utility and grid partners • Applicable regulatory agencies • National Weather Service (NWS) • State and Federal Environmental Agencies (Cal EPA, US EPA, etc.) • Public sector stakeholders near the facility (special districts, infrastructure agencies, etc.) • State emergency management authorities • Neighboring Emergency Management authorities

Details on the use of the Notification List and any additional contact information should be provided in the EAP. It is recommended that the ISO use a mass notification system to automate the process of notifying individuals or groups via phone call, SMS, and/or emails. A mass notification system is a faster, reliable way to notify individuals and implement a structured Notification List during emergencies.

It is recommended that the Notification List be tested at least annually, with all acknowledgements of receipt from listed points of contact recorded. This helps ensure the accuracy and reliability of the emergency notification process. Following the annual test, the ISO should update all listed contact numbers, email addresses, and other relevant information as needed. In addition to annual testing, it is recommended that the Notification List be reviewed following any staffing changes, organizational restructuring, or system modifications that could affect the listed contacts. All updates and test results should be documented and retained for future reference. To support effective recordkeeping, each version of the Notification List should be clearly dated, and version controlled.

4.3.2 Public Safety Partners Notification Procedures

The ISO should include notification procedures in the EAP to ensure that public safety authorities are provided with timely and accurate information on conditions during an incident. Procedures for early notification are required to allow all entities involved to respond appropriately. After initial notification, the ISO should make periodic status reports to the affected emergency authorities and other stakeholders in accordance with the notification procedures. If conditions continue to deteriorate despite response efforts, local authorities may choose to adjust their protective actions and operational priorities. Depending on the nature of the incident and its potential off-site impacts, emergency agencies may consider issuing warnings, implementing protective actions, or mobilizing additional resources until the situation is stabilized.

When performing notification and communication activities, it is important to speak in clear, nontechnical terms to ensure that those being notified understand what is happening at the facility, what the current emergency level is, and which actions to take. To assist in this step, the EAP may include checklists and/or pre-scripted messages to assist in adequately describing the emergency situation to public safety authorities. Different messages can be developed for each emergency level. **Appendix D: Emergency Notification Essential Elements of Information** provides example Essential Elements of Information the ISO should provide to external organizations during emergencies. includes template language for alerting public safety partners of emergency conditions at BESS facilities.

Where applicable, the EAP should describe procedures for coordinating information related to hazardous conditions, including weather forecasts, plume modeling, system failures, or other emergency scenarios. This should include how coordination will occur, the communication process, and identification of responsible parties with contact information. Coordination with agencies such as the NWS is recommended to monitor local weather, wind patterns, and conditions that may influence smoke or gas plume behavior.

The EAP should also outline reliable, redundant communication systems that can be used in the event of primary communication system failure. This ensures that critical information regarding emergency conditions can continue to be shared with on-site personnel, emergency response partners, and the public. All alternative systems should be tested regularly to ensure operational readiness and documented within the EAP, including activation procedures, primary points of contact, and maintenance schedules.

4.3.3 Notification of the Public

Proper coordination and communication among onsite technical personnel at the facility, emergency personnel, corporate communications teams, and Public Information Officers (PIO) are of critical importance to the successful implementation of the EAP. This coordination will ensure that public messaging is aligned with operational priorities and local public safety directives. These activities should be thoroughly tested during comprehensive EAP exercises and modified, as necessary.

It is recommended that the ISO promptly notify the public within the relevant Emergency Planning Zones when an emergency occurs at a BESS facility. This notification must include the owner/operator of the facility, nature of the incident, and the designated emergency level. **Table 4** provides template public emergency notifications for Level 2 and 3 BESS emergencies. These notifications should NOT include recommended protective actions which are outside the authority of the ISO. The ISO should not assume or usurp the responsibility of government entities for issuing protective actions. However, situations may arise where immediate notification of certain individuals or groups, such as nearby residences, businesses, or recreational areas, is necessary to ensure timely protective actions prior to official protective actions being disseminated. In such cases, the ISO may establish procedures for providing direct notification, provided these procedures are pre-coordinated and approved by the appropriate authorities during the EAP development process.

Table 4: Template Public Emergency Notifications

Level	Public Notification Example
Level 2	This is a notification from **[Owner/Operator Name]. A Level 2 Emergency is occurring** at the **[Facility Name]**, located at **[Site Location]**. While the incident remains under control, there is potential for limited off-site effects such as odors or visible smoke. Emergency responders are actively responding to the incident. The public is advised to remain alert and follow any instructions issued by local public safety authorities.
Level 3	This is a notification from **[Owner/Operator Name]. A Level 3 Emergency is occurring** at the **[Facility Name]**, located at **[Site Location]**. An incident has occurred with confirmed or imminent impacts beyond the facility boundary. Please follow directions from public safety officials and monitor official public safety communication channels for urgent updates.

It is strongly recommended that the ISO disseminate incident-related information on its own platforms. This may include facility websites, media statements, or social media posts to reinforce public messaging and provide operational transparency while ensuring consistency with official public notifications. Interaction with the media should be implemented through the local emergency management authority. These agencies should have a PIO and/or a Joint Information Center for disseminating information and handling inquiries. It is highly recommended that the ISO and the appropriate incident or emergency management authority work in partnership to accomplish this task. To support these efforts, it is recommended that predeveloped messaging templates, public safety announcements, and FAQs are prepared for a foreseeable emergency.

4.4 Emergency Protective Actions

4.4.1 Facility Response

After initial notifications, the ISO is responsible for managing the incident and minimizing impacts to life, property, the environment, and energy system reliability. This step involves a continuous process of implementing response actions, monitoring conditions, and issuing updates through established communication channels. This phase involves an ongoing process of implementing response actions. The EAP may go through multiple emergency levels during this phase, depending on how the situation evolves.

The EAP should detail actions the ISO will take to stabilize or mitigate the incident, including steps to control system conditions. Examples include isolating energy storage containers, reducing thermal load, or adjusting ventilation to limit hazardous releases. Additional mitigation measures may include activating fire suppression systems, shutting down affected circuits to prevent escalation, and deploying containment systems to limit the spread of hazardous materials. The ISO should develop reference tables identifying specific response actions for minimizing impacts of BESS facility incidents. Procedures must specify who is authorized to carry out these actions, how they will be executed, and any required coordination with upstream systems, utilities, or operational partners. On-site personnel should continue monitoring system conditions during the incident, where safe. A designated on-site monitor should be assigned at the onset of a BESS emergency and remain in place until the incident is resolved. This individual will provide timely status updates to the ISO to keep all involved personnel informed of changing conditions. The ISO may also be responsible for initiating on-site evacuation or shelter-in-place procedures based on incident severity. The EAP should clearly identify evacuation routes, muster points, and procedures for accounting for all personnel.

Instructions for the operation of the facility during the anticipated emergency should be provided. Backup systems and procedures should be developed to verify the accuracy of alarm and sensor data. Monitoring systems should include redundant power supplies and fail-safes for communication loss. Regular functional testing, alarm drills, and system calibration should be conducted to confirm system reliability.

To ensure responder safety, The ISO should organize response efforts at the facility using the standard Hot, Warm, and Cold Zone structure. The Hot Zone, or exclusion zone, is the immediate area surrounding the hazardous materials incident. Only trained emergency personnel with appropriate personal protective equipment should enter the Hot Zone to conduct containment or suppression activities. Surrounding the Hot Zone is the Warm Zone, which serves as a buffer area for equipment decontamination and staging. It may still present exposure risks and should be controlled and monitored closely. Beyond these areas lies the Cold Zone, considered safe from immediate hazards. Clearly defining and maintaining these zones during an incident helps limit exposure and ensure coordinated actions between facility personnel and emergency responders.

4.4.2 Incident Command Posts

Incident Command Posts (ICP) should be strategically located to ensure command and control can be safely maintained while minimizing risk to personnel. The ICP should be established outside of the Hot Zone, ideally in the Cold Zone, and at an upwind and uphill location from the incident scene to prevent exposure to toxic gases, smoke, or fire. This location must provide a clear line of sight to the incident area if possible, access to communication systems, and enough space to accommodate first responders. The ICP location should be pre-identified in the EAP and clearly marked on facility emergency maps. Maps should include prevailing wind directions, primary and secondary ICP sites, evacuation routes, and access control points. Coordination with first responders is essential to validate the suitability of proposed ICP locations.

4.4.3 Access Control and Road Closures

During an incident, safety and security measures should be implemented to secure the affected operational areas at the BESS site to protect operations personnel and the public and permit an effective performance of emergency response actions. Provisions for site security and access control measures during emergencies should be specified within the EAP. These measures may include securing the facility perimeter, managing controlled site entry for authorized personnel, and coordinating with law enforcement or contracted security services as appropriate based on incident type and severity.

Road closures should be implemented by law enforcement during, as needed, emergencies to control access to impacted areas, protect the public from entering hazardous zones, and facilitate safe movement of emergency vehicles. Road closures should be coordinated with local public works agencies and may include full or partial closures of roads within or adjacent to the Protective Action Zone. Dynamic factors such as wind direction, fire intensity, and plume travel may influence which roads are closed and for how long. Clear signage, traffic rerouting, and public notification are essential to ensure compliance and maintain order. The affected jurisdictions will maintain communication with regional traffic management centers to monitor impacts and adjust closures as needed.

4.4.4 Air Quality Monitoring

The EAP shall provide procedures for conducting real-time air monitoring and sampling during smoke-generating incidents (e.g., fires, chemical releases). The plan shall include:

- **Air Monitoring Methods:** Identify real-time monitoring equipment capable of detecting particulate matter ($PM_{2.5}$, PM_{10}), volatile organic compounds (VOCs) such as hydrogen fluoride (HF), and other combustion by-products of concern. Establish data collection protocols to allow for rapid evaluation of potential community exposures.
- **Deployment Strategy:** Monitoring should occur at multiple locations, including inside the facility fence line, on the incident perimeter, at staging locations, and at downwind locations, ensuring effective coverage of high-risk areas. Monitoring should begin as early as possible during an incident and continue throughout the response to assess changing conditions; therefore, fixed monitoring equipment should be in place during routine operation. Define procedures for mobile sampling, including the potential use of unmanned aerial systems (UAS/drones) to collect air quality data in areas that are unsafe or inaccessible to personnel.
- **Operational Requirements:** Designate trained personnel responsible for operating and interpreting air monitoring results. Ensure all drone operations comply with FAA Part 107 requirements and are conducted by certified operators. Establish safety protocols for operating drones in coordination with the Incident Commander and other emergency response agencies.
- **Data Use and Communication:** Establish clear procedures for interpreting results and communicating data promptly to the Incident Commander and emergency response team for immediate protective action decisions. Data should be interpreted by appropriately qualified subject matter experts to ensure accuracy. Summarized results should be incorporated into post-incident reporting and used to inform follow-up environmental sampling.

4.4.5 Real World Plume Modeling

The ISO shall have the ability to provide real-time situational status of batteries, modeling of gas releases of exact number of batteries overheating or in conflagration/deflagration to inform emergency response actions that could occur in near-real time. This capability should include computationally fast models that require little input data, such as real-time wind speed and direction data. The scale of the dispersion scenario is on the order of a few kilometers downwind of the source or less, including areas occupied by facility personnel, firefighters, and surrounding neighborhoods.

4.4.6 Toxic Runoff Control and Mitigation

Battery fires at BESS facilities have the potential to generate toxic runoff. During and after an incident, water runoff may contain hazardous substances such as heavy metals, corrosive electrolytes, and toxic organic compounds, all of which pose significant risks to aquatic ecosystems, soil health, and potentially human health if drinking water sources become contaminated. Fire debris from burned battery systems often contains hazardous materials, including metals, perfluorinated compounds, and polyaromatic hydrocarbons (PAHs). Rain events can wash these substances from the debris into nearby soils and waterways. Damaged or degraded batteries may leak electrolyte, which may contain corrosive and toxic substances like lithium salts and organic solvents. Rain could spread these leaked materials, potentially impacting surrounding ecosystems. Additionally, firefighting water runoff can become a vehicle for transporting toxic combustion byproducts. While there is ongoing research and debate regarding the extent of contamination, some studies suggest that such runoff can be harmful, particularly to aquatic life.

4.5 Public Protective Actions

The local law enforcement agency, local fire protection district, and/or health department have the responsibility and authority to issue the protective actions, such as health advisories, shelter in place or evacuation warnings or orders to the community during an emergency. The ISO should work public safety authorities to evaluate the current situation modeling and mapping in relation to Emergency Planning Zones to inform public protective action decisions. Protective actions should be recommended to public safety officials as they pertain to active incidents on site. Coordination among responding agencies is essential to avoid conflicting messages and ensure public trust and compliance.

4.5.1 Evacuation Warnings and Orders

Evacuation Warning and Orders are a significant countermeasure to prevent or reduce exposure of the public. It is a complex operation involving several governmental jurisdictions. Evacuation protocols are key elements in an EAP exercise but are not typically included in the EAP. The EAP should, however, clearly describe the notification, warning, and evacuation responsibilities of the ISO and the local public safety authority.

Evacuation planning and implementation is the responsibility of local law enforcement with the legal authority to perform these actions. However, it is best practice for the EAP to acknowledge frameworks specifically designed to address the unique impacts of BESS facility hazards. Given their radial design, it is strongly recommended to leverage established Emergency Planning Zones when determining evacuation areas. Unlike traditional evacuation zones that typically follow natural barriers or roadways, radial evacuation zones are designed as concentric circles expand outward from the incident site. This scalable approach maximizes the protection of human life by accounting for dynamic environmental and weather conditions.

Emergency evacuation plans should be developed before an incident occurs. The plans are recommended to be based on a worst-case scenario. Plume modeling maps developed by the ISO must be shared with public safety authorities. These maps may inform the development of evacuation plans. It is important for ISO to coordinate with the appropriate emergency management authorities and provide modeling outputs that can support evacuation planning.

4.5.2 Shelter in Place

Shelter-in-place is an emergency response directive that instructs individuals to stay indoors, shut doors and windows, and to secure all openings to prevent exposure to external hazards. Shelter-in-place can be used when evacuating the public would cause greater risk than staying where they are, or when an evacuation cannot be performed. Shelter in place procedures differ depending on whether the threat is a specific hazardous materials release or general smoke production, as each presents unique risks and requires specific protective actions. In the case of a hazardous materials release, sheltering in place is a critical safety measure to prevent inhalation of harmful airborne substances. The goal is to completely seal the indoor environment to prevent infiltration. By contrast, during general smoke events, such as those caused by wildfires or structural fires, the purpose of sheltering in place is to reduce exposure to particulate matter and irritants, rather than to seal off from highly toxic or fast-acting substances. While staying indoors still offers protection, the emphasis is more on improving indoor air quality rather than fully sealing the space. Shelter-in-place may not be the best option if (a) the vapors are flammable; (b) if it will take a long time for the gas to clear the area; or (c) if residential buildings cannot be closed tightly. Vehicles can offer some protection for a short period if the windows are closed, and the ventilating systems are shut off. Vehicles are not nearly as effective as buildings for in-place protection.

4.5.3 Public Health Advisories

Public Health Advisories may be issued when an incident at the BESS facility poses potential or confirmed health risks to the surrounding community due to airborne contaminants, toxic exposures, or environmental degradation. Public health authorities are responsible for assessing health risks in coordination with environmental monitoring data, plume dispersion models, and first responder reports. Advisories may include warnings about air quality, recommendations to avoid certain areas, use of respiratory protection or indoor air purification, restrictions on water use, agricultural activity, or outdoor activity, and guidance for sensitive populations such as children, older adults, and individuals with certain medical conditions.

4.6 Termination and Follow-Up

The EAP should explain the expected termination and follow-up procedures for BESS facility safety incidents and emergencies. The ISO is responsible for determining when on-site conditions have stabilized, and the operational emergency has concluded. The plan should outline the process for determining when an incident has been controlled and stabilized, and the criteria for formally concluding and demobilizing emergency response. This decision should be made in consultation with technical experts, operations staff, and applicable regulatory agencies when required.

Generally, the ISO, or designated safety officer or incident commander, is responsible for notifying the authorities that the condition of the BESS facility has been stabilized. Simultaneously, local public safety authorities retain responsibility for determining when broader emergency response activities, including public protective actions, evacuations, or community notifications, may be formally concluded. Both the ISO and the emergency management authorities should coordinate closely when making decisions to terminate on-site operational actions and off-site response efforts to ensure public safety and operational accountability.

Following the conclusion of an incident, recovery activities may continue at various levels, depending on the nature and severity of the emergency. While recovery operations are typically addressed in business continuity or recovery plans separate from the EAP, facility operators should give consideration to recovery planning, particularly for facilities that support critical infrastructure such as electricity distribution or grid reliability. Additionally, The ISO should coordinate a formal follow-up evaluation with all involved participants following any emergency. Participants should maintain logs and records throughout the incident to support this evaluation. The results should be documented in an After-Action Report (AAR) and used to improve future EAP procedures, emergency response actions, and operational readiness.

4.6.1 Onsite Cleanup and Confirmation Sampling Plan

The plan must detail the procedures for safely handling, storing, transporting, and disposing of damaged or destroyed batteries after an incident. It should also cover the processes for removing, stockpiling, transporting, and disposing of contaminated soil, and include specifics on confirmation sampling to validate site cleanup.

5 Plan Distribution and Maintenance

5.1 Emergency Action Plan Submission

The ISO should submit separate searchable PDF documents. Due to the sensitive nature of the documents and the public nature of government records, the ISO should include both unredacted and redacted versions of the EAP, and all associated models and maps. All maps, diagrams, and modeling reports must be embedded in the PDF or attached as appendices. If Geographic Information System (GIS) files are used to support the mapping, those files should be submitted separately in industry-standard formats.

The files should be named using the following convention:

- [Year]_[ISO Owner & Operator Legal Name]_[Facility Name]_Emergency Action Plan_[Version] - CONFIDENTIAL.pdf
- [Year]_[ISO Owner & Operator Legal Name]_[Facility Name]_Emergency Action Plan – Plume Dispersion Models & Maps_[Version] - CONFIDENTIAL.pdf
- [Year]_[ISO Owner & Operator Legal Name]_[Facility Name]_Emergency Action Plan – Watershed Pollution Maps_[Version] - CONFIDENTIAL.pdf
- [Year]_[ISO Owner & Operator Legal Name]_[Facility Name]_Emergency Action Plan_[Version] - REDACTED.pdf
- [Year]_[ISO Owner & Operator Legal Name]_[Facility Name]_Emergency Action Plan – Plume Dispersion Models & Maps_[Version] - REDACTED.pdf
- [Year]_[ISO Owner & Operator Legal Name]_[Facility Name]_Emergency Action Plan – Watershed Pollution Maps_[Version] - REDACTED.pdf

All EAP submissions must be sent via email to: clearinghouse@countyofmonterey.gov. File sizes must not exceed 100 MB in total. If the size exceeds this limit, the ISO should provide access to a secure download link or coordinate a secure file transfer with the reviewing authority.

The subject line should follow this format:

- [ISO Owner & Operator Legal Name]_[Facility Name]_Emergency Action Plan Submission – [Submission Date]

In the body of the email, clearly state the name of the submitting ISO, the facility name, and date of submission. A brief summary of included attachments is recommended.

5.2 Emergency Action Plan Review

Upon receipt, the reviewing agency will issue an acknowledgment and assign a tracking number. The County reserves the right to conduct the initial review typically within 30 calendar days. If the EAP is found to require changes or clarification, technical comments will be issued within 60 days. Final review or request for revision will be provided no later than 90 days from the date of submission. A designated technical contact must be identified by the ISO to assist with any questions during the review process. In certain cases, a follow-up meeting may be requested with local fire officials, emergency management personnel, or regulatory staff to review plume modeling results and ensure alignment with response protocols.

Upon receipt, the receiving agency will coordinate a multi-agency review with the below agencies. The receiving agency will compile and collate review comments to be transmitted to the ISO.

The following agencies SHALL review and provide comment:

- County of Monterey Department of Emergency Management
- County of Monterey Health Department, Environmental Health Bureau
- County of Monterey Housing and Community Development Department
- County of Monterey Sheriff's Office
- Local Fire Protection District

The following agencies MAY review and provide comment:

- California Highway Patrol
- California Department of Transportation
- California Environmental Protection Agency
- County of Monterey Administrative Office
- Monterey Bay Air Resource District
- National Weather Service

5.3 Plan Distribution

The BESS EAP, at a minimum, should be distributed to all agencies listed in the Notification List. Facility personnel should have ready access to the most current version, and a version should be maintained on-site in a clearly marked, accessible location. Updates or revisions to the EAP must be promptly shared with all recipients. An up-to-date copy of the Notification List should be posted in prominent places at the facility.

ISOs may wish to limit the information provided to external entities participating in the EAP. To protect restricted information, such as technical data and contact information of individuals on the Notification List, ISOs should consider maintaining a redacted copy of the EAP. Decisions about what to include in the redacted copy should be made by those participating in the EAP. The redacted copy made available to the public upon request should not contain restricted information, such as detailed technical data or contact information.

5.4 Maintenance and Update

After the EAP has been developed and distributed, it is considered best practice to conduct ongoing reviews and updates. Updates are advisable when there are changes in contact information, significant modifications to the facility, or revisions of emergency procedures. An annual review of the EAP is recommended to ensure adequacy, update as necessary, and document the review regardless of whether revisions are made. The EAP should be updated following any exercise, in addition to periodic verifications of the Notification Lists.

A comprehensive review is encouraged to assess changes in site conditions, nearby land use, population density, emergency access routes, equipment upgrade or modifications, system configuration, capability changes, regulations, and recent incidents. A comprehensive review would include a determination of whether any plume modeling or additional mapping is needed. Once the EAP has been revised, the updated version should be dated and distributed to those on the distribution list.

5.5 Training

Training is essential for ensuring personnel are prepared to effectively implement the EAP. It is advisable that a comprehensive training program is established by the ISO in coordination with partner agencies identified in the EAP. It is strongly recommended that all facility personnel with EAP responsibilities receive regular training to ensure familiarity with emergency procedures, equipment, notification protocols, and their specific roles during an incident. A comprehensive training should include incident detection, evaluation, notification, and response actions for each emergency level classification. It is considered best practice to train enough personnel to ensure comprehensive coverage during weekends, holidays, and after-hours. Maintaining records that document the type and frequency of training is beneficial. At a minimum, new staff are advised to receive training upon assignment, with annual refresher training recommended to maintain readiness.

5.6 Exercising

The ISO should exercise the EAP in coordination with public safety officials. Exercises explore the strengths and gaps of the plan, improve readiness, and strengthen coordination with emergency response partners. Lessons learned during exercises are vital to the ongoing improvement of the plan. Exercise design should follow recognized frameworks, such as the FEMA Homeland Security Exercise and Evaluation Program (HSEEP), to align with emergency management standards. Exercises generally fall into two categories:

Discussion Based Exercises focus on familiarizing stakeholders with plans, policies, and roles.

- **Seminars** introduce or review procedures and concepts.
- **Workshops** develop tools or processes such as training plans.
- **Tabletop Exercises** explore scenarios through facilitated discussion and evaluation.

Operational-Based Exercises test capabilities, decision-making, and coordination in real time.

- **Drills** evaluate specific functions or procedures, like testing the Notification List.
- **Functional Exercises** assess multi-agency coordination and command capabilities through scenario-based simulations without "boots on the ground."
- **Full-Scale Exercises** engage all levels of response in a realistic scenario with full operational deployment.

A full-scale exercise is the final step in an exercise progression and should be conducted only after smaller activities, including a functional exercise, have prepared participants. Seminars, drills, tabletops, and functional exercises should be prioritized in EAP exercise programs. **Table 5** outlines recommended exercise frequencies, which should be tailored by the ISO in coordination with public safety partners.

Table 5: BESS EAP Exercise Frequency Recommendations

Exercise Type	Recommended Frequency
Seminars with primary public safety officials	Annually
Drills to test the Notification List and EAP procedures	Annually
Tabletop Exercise*	Every 1-2 years or before functional exercises
Functional Exercise	Every 5 years

All exercises should be evaluated both verbally and in writing. Following each exercise, an evaluation should identify strengths and areas for improvement, with findings incorporated into updates to the EAP, training, or procedures. The review should address the accuracy of EAP content, such as contact information and maps, as well as the effectiveness of procedures, responsibilities, and resource levels. Feedback from all participants should be incorporated to evaluate performance before, during, and after the event. Based on the findings, the EAP should be updated as needed and redistributed to all relevant stakeholders.

*It is recommended that a tabletop exercise be conducted with appropriate partners prior to a BESS facility becoming operational.

Appendices

Appendix A: EAP Review Check List

General Document Items

- ☐ Is the name of the facility and other relevant identifiers clearly labeled in large letters in the EAP?
- ☐ Is the document a controlled document (i.e., each distributed plan is individually numbered and contains a statement that the plan is not to be copied or distributed by anyone other than the independent system operator)?
- ☐ Is there a table of contents?
- ☐ Are the roles and responsibilities of key emergency personnel clearly documented, preferably at the beginning of the document?
- ☐ Is there an up-to-date revision sheet provided near the beginning of the document?
- ☐ Are revision numbers and revision dates provided as footers on each page of the document?

Detection and Decision-Making Items

- ☐ Are detection and/or early warning systems at the facility clearly described?
- ☐ Are the emergency levels clearly described?
- ☐ Are there clear guidelines and decision criteria to help the ISO determine the appropriate level for potential unusual and emergency conditions that could occur at the facility?

Notification and Communication Items

- ☐ Are primary and backup communication systems among the ISO, local emergency responders, and other key stakeholders described in the document?
- ☐ Are the notification flowcharts complete and logical?
- ☐ Are phone numbers, after-hours phone numbers, and backup personnel listed on the notification flowcharts and emergency contact lists?
- ☐ Do the notification flowcharts include contacts for timely notification of local emergency management organizations for more serious emergency levels?

Pre-Planned Action Items

- ☐ Has an HMBP been electronically submitted in CERS?
- ☐ Are there descriptions of recommended preplanned actions for potential unusual and emergency conditions at the facility?
- ☐ Is there a list of locally available engineering, labor, materials, and equipment resources that can be referenced in an emergency?
- ☐ Has the contact information for the locally available resources been recently updated or verified?
- ☐ Are the primary and secondary access routes to the site clearly described?
- ☐ Is an accurate facility site map included?
- ☐ Does the EAP identify the types of air monitoring equipment required and specify the equipment's

placement to ensure effective coverage of high-risk areas?

- ☐ Is it noted in the EAP if the ISO has real-time plume modeling capabilities?
- ☐ Is a toxic water runoff control plan provided?
- ☐ Are emergency planning zones provided?
- ☐ Are proof of pre-incident or baseline sampling included?

Modeling, Mapping, and Environmental Impact

- ☐ Are plume dispersion models provided?
- ☐ Are all nearby sensitive populations identified?
- ☐ Are watershed pollution maps provided?
- ☐ Are all UL safety test results and reports provided?
- ☐ Is a community off-site sampling plan provided?
- ☐ Are safety data sheets (SDS) provided for each battery type?
- ☐ Are all UL safety testing reports and results included?

Termination and Follow-up Items

- ☐ Is the person with the authority to terminate emergency operations identified?
- ☐ Are the procedures for terminating emergency operations clearly described?
- ☐ Is there guidance on follow-up responsibilities after the emergency is terminated?

Other Items

- ☐ Are clear procedures for testing and updating the document provided?
- ☐ Is the frequency of testing and updating the document clearly described?
- ☐ Is the person or position responsible for updating the document indicated along with current contact information for that person?
- ☐ Are the processes for training personnel in how to use the document and the frequency and responsibility for this training clearly described?

Appendix B: Moss Landing BESS Emergency Planning Zones

The Moss Landing Power Plant BESS facility Emergency Planning Zones includes 12 Protective Action Zones (PAZs) and 5 Public Education Zones (PEZs). To obtain PAZ and PEZ layers, contact the County of Monterey Department of Emergency Management.

Figure 1: Moss Landing BESS Emergency Planning Zones

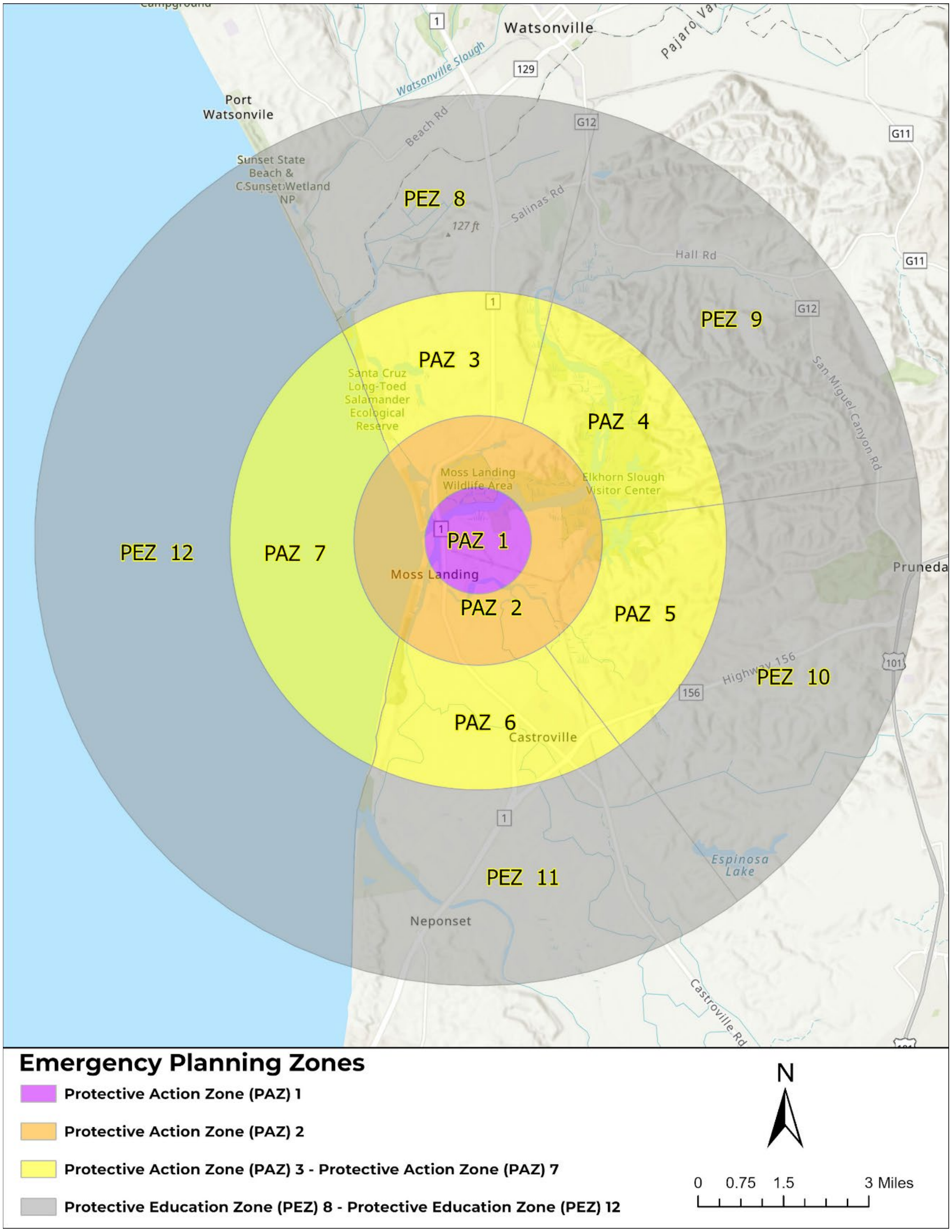

Table 6: Moss Landing BESS Emergency Planning Zones

Zone #	Zone Distance	Jurisdictions	Description
Protective Action Zones (PAZs)			
PAZ 1	0.75-Mile radius from plant	Unincorporated Monterey County	Moss Landing Power Plant, Moss Landing Harbor
PAZ 2	0.75-Mile to 1.75-Miles from plant	Unincorporated Monterey County, Monterey Bay	Moss Landing Harbor, Monterey Bay, Elkhorn Slough
PAZ 3	1.75 miles to 3.5 miles from plant	Unincorporated Monterey County	McClusky Slough, Elkhorn Slough
PAZ 4	1.75 miles to 3.5 miles from plant	Unincorporated Monterey County	Elkhorn Slough
PAZ 5	1.75 miles to 3.5 miles from plant	Unincorporated Monterey County	Elkhorn Slough, Moro Cojo Slough
PAZ 6	1.75 miles to 3.5 miles from plant	Unincorporated Monterey County	Castroville
PAZ 7	1.75 miles to 3.5 miles from plant	Monterey Bay	Monterey Bay, inside US territorial sea
Public Education Zones (PEZs)			
PEZ 8	3.5 miles to 6.25 miles from plant	Unincorporated Monterey County, Unincorporated Santa Cruz County	Watsonville Slough, Pajaro Valley, Hilltop/Royal Oaks
PEZ 9	3.5 miles to 6.25 miles from plant	Unincorporated Monterey County	Elkhorn Slough, Las Lomas
PEZ 10	3.5 miles to 6.25 miles from plant	Unincorporated Monterey County	Prunedale
PEZ 11	3.5 miles to 6.25 miles from plant	Unincorporated Monterey County	Neponset, Salinas River lagoon
PEZ 12	6.25 miles to 8.25 miles from the plant		Monterey Bay, inside US territorial sea

Appendix C: Guidance Table for Determining Emergency Level

Table 7: Sample Guidance Crosswalk for Determining Emergency Level

Event	Situation	Emergency Level
Thermal Anomaly	Abnormal temperature reading in a single cell or module; localized to unit	Level 0
	Elevated temperature requiring system shutdown or inspection; risk of cell venting	Level 1
	Sustained overheating or thermal runaway in one unit; smoke present	Level 2
	Multiple units in thermal runaway; active fire; suppression failure	Level 3
Gas/ Vapor Release	Odor or readings from monitoring sensors within normal limits but unusual	Level 0
	Elevated H_2, CO, or other gas levels contained inside container or room	Level 1
	Gas levels triggering alarms; potential breach of enclosure	Level 2
	Confirmed toxic release from container affecting ambient air quality	Level 3
Fire/ Smoke	Trace smoke or odor detected internally; no open flame	Level 0
	Smoke within container/room; suppression system active; no external release	Level 1
	Visible smoke escaping enclosure; minor flame; off-site detection (visual, odor, air monitors)	Level 2
	Active fire involving multiple containers; risk of explosion or plume dispersion	Level 3
System Failure	Minor system alert or component-level fault without affecting safety or operations	Level 0
	Failure of primary system; backups engaged	Level 1
	Loss of primary and backup systems impacting site safety controls or fire protection systems	Level 2
	Critical failure resulting in uncontrolled energy release, cascade risk, or complete loss of control	Level 3
Explosion/ Deflagration	Audible venting or small pressure release without damage	Level 1
	Minor explosion contained within cabinet/enclosure	Level 2
	Explosion breaches container; risk of fragmentation, fire, or chemical plume	Level 3
Security Threat	Unauthorized access or suspicious activity observed on surveillance	Level 0
	Confirmed breach of perimeter; investigation initiated	Level 1
	Explosive device or confirmed attack with damage to storage systems	Level 3
	Verified threat to critical systems or targeted sabotage	Level 2

Event	Situation	Emergency Level
Earthquake	Seismic event nearby; facility inspection underway	Level 0
	Damage to racks or fire systems observed during post-event inspection	Level 1
	System damage that limits containment, access, or monitoring capability	Level 2
	Structural damage with hazardous material release or electrical fire outbreak	Level 3

Appendix D: Emergency Notification Essential Elements of Information

Table 8: Emergency Notification Essential Elements of Information

Level	Information to External Organizations
LEVEL 0 On-Site Only *Notification Only*	• Explain the current situation at the BESS facility (e.g., coolant leak, minor system alert, or abnormal but stable readings). • Confirm that there is no impact to safety, operations, or the environment. • State that this is a Level 0 Notification Only - for awareness and documentation purposes only. • Indicate no escalation is expected, and no off-site consequences are anticipated. • Indicate whether updates will be provided (e.g., "No further updates are planned unless conditions change."). • Provide contact information for documentation, oversight, or follow-up questions
LEVEL 1 On-Site with Possible Off-Site Impact *Awareness Messaging*	• Explain the current situation at the BESS facility (e.g., partial system loss, minor smoke, equipment fault). • State this is a **Level 1 Emergency -** there is no off-site impact at this time, but partners are being notified out of an abundance of caution • Describe the mitigation or response actions underway (e.g., diagnostics, backups online, facility engineering response). • Indicate whether the situation has the potential to escalate and estimate the timeframe if applicable. • Refer partners to hazard maps, plume modeling, or EAP materials to support situational awareness. • Indicate when you will provide the next status report**.** • Indicate who can be called for any follow-up questions or coordination**.**
LEVEL 2 Minor Off-Site Impact *Public Health Advisory*	• Explain the current situation at the BESS facility (e.g., partial system loss with potential off-site effects, fire/spill impacting critical systems). • State this is a Level 2 Emergency - there is minor off-site impact with potential for further consequences. • Describe the response and mitigation measures underway (e.g., suppression systems, hazmat monitoring, fire department coordination). • If applicable, provide an estimate of how long until the situation could escalate. • Refer to plume modeling, hazard zones, or EAP projections and describe areas that may be at risk. • Indicate when you will provide the next status report. • Indicate who can be called for any follow-up questions.
LEVEL 3 Off-Site Impact *Public Protective Actions*	• Explain the current situation at the BESS facility (e.g., large fire, explosion, or hazardous material release with off-site consequences). • State this is a Level 2 Emergency - there is an off-site impact, and immediate protective actions may be required. • Refer to plume modeling, hazard zones, or EAP projections and describe areas that may be at risk. • Indicate when you will provide the next status report. • Indicate who can be called for any follow-up questions.

Appendix E: Public Safety Emergency Notification Templates

Level 3: Notification Checklist

- Inform the call recipient of the nature of the emergency. Use the script below.
- Clearly state that this is a **Level 3 Emergency with off-site impact.**
- Refer to plume modeling, fire spread projections, or hazard maps.
- Indicate when the next status update will be provided.
- Provide a contact for follow-up.
- Log each notification call. Include the following details:
    - Confirmation that the recipient understands the emergency nature of the call
    - Time of notification
    - Agency or entity notified
    - Method of notification (e.g., phone, radio, email)
    - Name and title of the individual receiving the call
    - Any actions taken or questions asked during the call

Use the Following Template to Make Notifications

1. "This is an emergency. This is [Your Name], [Your Position] at the [Facility Name or Operator Agency]."
2. "We are experiencing a severe emergency at the [Facility Name] Battery Energy Storage System. This is a **Level 3 Emergency** involving [brief description – e.g., a large fire with toxic smoke, explosion risk, or hazardous material release]. Public health and safety in the surrounding communities are at significant risk due to this incident."
3. "We have activated the facility's Emergency Action Plan and have determined this to be a Level 3: Off-Site Impact Emergency. Immediate protective actions may be necessary. Reference the plume modeling, hazard maps, or off-site consequence projections provided in your copy of the Emergency Action Plan or shared with you electronically."
4. "I can be reached at [Your Phone Number]. If you are unable to reach me, please contact [Alternate Contact Name and Title] at [Alternate Number]."
5. "We will provide our next update in approximately [___] minutes. If conditions change before then, we will notify you immediately."

Level Two: Notification Checklist

- Inform the call recipient of the nature of the emergency. Use the script below.
- Clearly state that this is a **Level 2 Emergency with minor off-site impact.**
- Describe the mitigation or response actions underway.
- If applicable, estimate how long until the situation may escalate.
- Refer to hazard maps or modeling projections.
- Indicate when the next status update will be provided.
- Provide a contact for follow-up.
- Log each notification call. Include the following details:
    - Time of notification
    - Agency or entity notified
    - Method of notification (e.g., phone, radio, email)
    - Name and title of the individual receiving the call
    - Any actions taken or questions asked during the call

Use the Following Template to Make Notifications

1. “This is an emergency. This is [Your Name], [Your Position] at the [Facility Name or Operator Agency].”
2. “We are experiencing a serious incident at the [Facility Name] Battery Energy Storage System. This is a **Level 2 Emergency** involving [brief description – e.g., a localized fire, thermal runaway event, or abnormal system behavior]. There is currently minimal off-site impact, with the possibility of more severe effects if the incident continues to escalate.”
3. “We have activated the facility’s Emergency Action Plan and are implementing mitigation actions, including [e.g., system shutdown procedures, fire suppression, hazardous gas monitoring, coordination with the fire department]. Our goal is to contain the situation and prevent escalation.”
4. “Based on current conditions, if response actions are not successful, the situation could escalate within approximately [___] minutes/hours. Out of an abundance of caution, we are coordinating with partner agencies and monitoring potential consequences.”
5. “We recommend reviewing the plume modeling, hazard maps, or other projections included in your copy of the Emergency Action Plan or distributed electronically. Areas that could be affected if the situation worsens include [brief description of nearby zones, communities, or landmarks].”
6. “I can be reached at [Your Phone Number]. If you are unable to reach me, please contact [Alternate Contact Name and Title] at [Alternate Number].”
7. “We will provide our next update in approximately [___] minutes. If conditions change before then, we will notify you immediately.”

Level One: Notification Checklist

- Inform the call recipient of the nature of the emergency. Use the script below.
- Clearly state that this is a **Level 1 Emergency with potential off-site impact.**
- Describe the mitigation or response actions underway.
- If applicable, estimate how long until the situation may escalate.
- Refer to hazard maps or modeling projections.
- Indicate when the next status update will be provided.
- Provide a contact for follow-up.
- Log each notification call. Include the following details:
  - Time of notification
  - Agency or entity notified
  - Method of notification (e.g., phone, radio, email)
  - Name and title of the individual receiving the call
  - Any actions taken or questions asked during the call

Use the Following Template to Make Notifications

1. "This is a notification only. This is [Your Name], [Your Position] at the [Facility Name or Operator Agency]."
2. "We are experiencing an incident at the BESS facility involving [brief description – e.g., partial system loss, minor smoke event, or component failure]. At this time, the incident is confined within the fence line."
3. "This is a **Level 1 Emergency**. We are notifying response partners out of an abundance of caution to ensure awareness and readiness in the event conditions change."
4. "We have implemented facility-level response protocols, including [e.g., system diagnostics, activation of backup systems, internal inspection, or engagement of facility engineering teams]."
5. "At this time, there is no threat to public safety or the environment. The situation is being monitored closely, and we are maintaining communication with response partners."
6. "We will provide our next update in approximately [___] minutes/hours, or sooner if the situation changes."
7. "For follow-up questions or coordination, please contact [Name, Title] at [Phone Number]. If unavailable, contact [Alternate Contact] at [Alternate Number]."

Level Zero: Notification Checklist

- Inform the call recipient of the nature of the emergency. Use the script below.
- Clearly state this is a **Level 0 Incident with notification only.**
- Describe the issue and any basic steps being taken.
- Confirm no off-site consequences or expected escalation.
- Indicate whether any updates will be provided.
- Provide a contact for documentation or oversight purposes.
- Log each notification (if made). Include:
    - Time of notification
    - Agency or entity notified
    - Method (e.g., email, internal log, phone)
    - Name and title of the individual receiving or acknowledging the notice
    - Any follow-up questions or instructions received

Use the Following Template to Make Notifications

1. "This is a notification only. This is [Your Name], [Your Position] at the [Facility Name or Operator Agency]."
2. "We are addressing a minor on-site issue at the [Facility Name] Battery Energy Storage System. This is a **Level 0 Incident**, involving [brief description – e.g., coolant system maintenance, a non-critical sensor alert, or abnormal but stable equipment readings]."
3. "There is no impact to safety, operations, or the environment. No action is required. We are documenting this for internal records and awareness."
4. "Incident maintenance and monitoring are underway. The system remains stable, and all safety mechanisms are functioning normally."
5. "No additional updates are anticipated unless the situation changes."
6. "For any follow-up, please contact [Your Phone Number], or [Alternate Contact Name and Number] if needed."

Appendix F: Battery Inventory Conflagration Exposure Guideline

Table 9: Example Battery Inventory Conflagration Off Gassing Concentrations

		[Chemical Name]	Acute Exposure Guideline Levels														
			10 min			30 min			60 min			4 hours			8 hours		
% of Battery Inventory	# of Battery Packs	ppm	AEGL 1	AEGL 2	AEGL 3	AEGL 1	AEGL 2	AEGL 3	AEGL 1	AEGL 2	AEGL 3	AEGL 1	AEGL 2	AEGL 3	AEGL 1	AEGL 2	AEGL 3
1%																	
5%																	
10%																	
15%																	
25%																	
50%																	
75%																	
85%																	
90%																	

Hydrogen fluoride 7664-39-3

	10 min	30 min	60 min	4 hr	8 hr
ppm					
AEGL 1	1	1	1	1	1
AEGL 2	95	34	24	12	12
AEGL 3	170	62	44	22	22

Carbon monoxide 630-08-0

ppm	10 min	30 min	60 min	4 hr	8 hr
AEGL 1	NR	NR	NR	NR	NR
AEGL 2	420	150	83	33	27
AEGL 3	1,700	600	330	150	130

- Acute Exposure Guideline Level 1 - Notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.
- Acute Exposure Guideline Level 2 - Irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
- Acute Exposure Guideline Level 3 - Life-threatening health effects or death.