Holliston 600 Central St Energy Storage Facility

EMERGENCY RESPONSE PLAN

Rev. 0 | April 25, 2023

Summary

This document serves as the Emergency Response Plan (ERP) for the Holliston 600 Central St energy storage facility to be located at 600 Central St in Holliston, MA 01746.

This ERP provides information and instructions to guide first responders in preparing for, and safely responding to, an incident, fire, or other emergency associated with the energy storage facility.

LIFE SAFETY SHALL BE THE HIGHEST PRIORITY DURING ANY TYPE OF EVENT.

Prepared For:

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1-833-SAFE-ESS

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EMERGENCY CONTACT INFORMATION

IN CASE OF EMERGENCY CALL 911

LOCAL FIRE STATION

Holliston Fire Department

Phone: (508) 429-4631

Address: 59 Central St
Holliston, MA 01746-2103

LOCAL POLICE DEPARTMENT

Holliston Police Department

Phone: (XXX) XXX-XXXX

Address: 703 Washington St
Holliston, MA 01746

HOSPITAL EMERGENCY ROOM

Hospital Emergency Room

Phone: (XXX) XXX-XXXX

Address: Address
Address

LOCAL BURN CENTER

Local Burn Center

Phone: (XXX) XXX-XXXX

Address: Address
Address

SYSTEM OWNER / OPERATOR

System Owner / Operator

Phone: (XXX) XXX-XXXX

Address: Address
Address

SUBJECT MATTER EXPERT (SME)

Subject Matter Expert

Phone: (XXX) XXX-XXXX

Address: Address
Address

REMOTE MONITORING FACILITY

Powin Remote Operations Center (ROC)

Phone: +1 (855) 888-3659

Address: Address
Address

CENTRAL STATION

Central Station

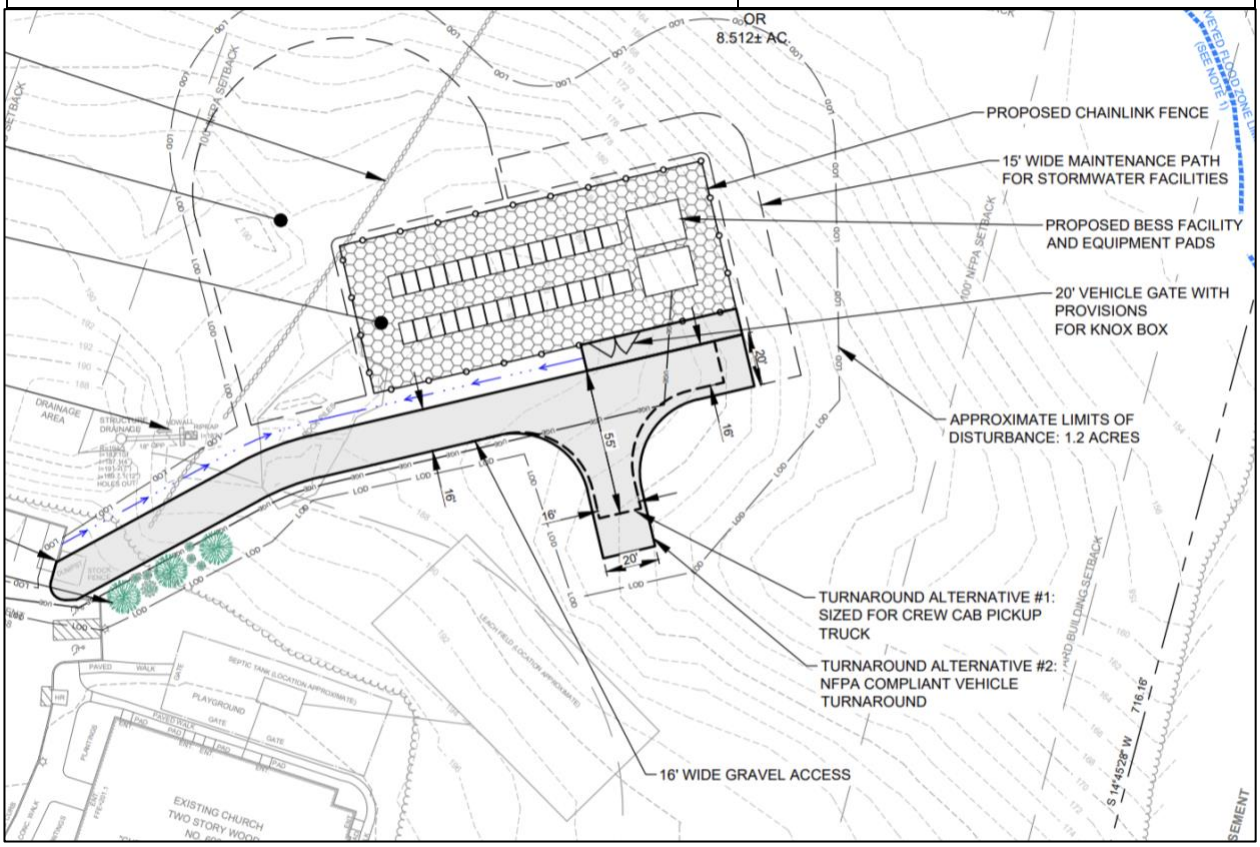
Phone: (XXX) XXX-XXXX

Address: Address
Address

ENERGY STORAGE SYSTEM INFORMATION

HOLLISTON 600 CENTRAL ST ENERGY STORAGE FACILITY

Site Address: **600 Central St** Holliston, MA 01746	
GPS Coordinates: 42°11'54"N, 71°24'14"W	**Special Flood Zone:** XX



ENERGY STORAGE SYSTEM

Make / Model: Powin Centipede Stack750E

Total MW / MWh: 4.99 MW / 19.96 MWh

kW / kWh per Unit: 186.5 kW / 746 kWh

 # Units: 30

EXPLOSION PROTECTION

- Active exhaust ventilation system triggered by gas detector to remove flammable gases from the enclosure

FIRE DETECTION SYSTEMS

- One (1) heat detector
- One (1) smoke detector
- One (1) gas detector

FIRE SUPPRESSION SYSTEM

- Stat-X aerosol fire suppression system triggered by heat or smoke detection

PROJECT INFORMATION

Project Name	**Holliston 600 Central St Emergency Response Plan**
Project No.	22-20407
Prepared For	**BlueWave Storage Origination, LLC** P.O. Box 171381 Boston, MA 02117
Revision No.	Rev. 0
Document No.	23-20407-E-D0
Date of Issue	4/25/2023

REVISION HISTORY

Revision No.	Date of Issue	Substance of Change
Rev. 0	4/25/2023	Draft issue

Note 1: *The information in this document is subject to change while in DRAFT status and may be modified in the event of modifications to equipment or other factors affecting the design of the system or site.*

Note 2: *During the operating life span of the project, it is expected that this document shall be reviewed annually, and that all pertinent information shall be appropriately updated as necessary. This ERP is compiled based upon current design and usage at the time of this writing.*

IMPORTANT NOTICE AND DISCLAIMER

Energy Safety Response Group LLC (ESRG) is providing an interim draft of this document based on an "*as-designed*" system. This document should not be provided externally until agreed by all responsible parties.

Upon acceptance of this "as designed" interim draft, which may be made public as an "*as designed release*," ESRG shall treat this document as ready for release but shall not mark the document as "*as-built final*" until ESRG can confirm, via personnel on site, that the system, "*as-built*" aligns with the reviewed and reported design.

The industry, related technology, and best practices are rapidly evolving and changing regularly. It has been observed that changes often occur to a project through the construction phase, be they to the battery itself or to the balance of system. As such, an "*as-designed release*" document should be considered final only if no changes are made to the system from design to construction to completion. If it is 100% accurate it will be released unchanged. However, should ESRG encounter deviations from the design, the document will be amended accordingly per the design changes and then released as a final document.

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ACRONYMS

AR	Arc-Rated
BMS	Battery Management System
E-Stop / EPO	Emergency Stop / Emergency Power Off
ERP	Emergency Response Plan
EMS / ESMS	Emergency Management System / Energy Storage Management System
ERG	Emergency Response Guide (generic, product-level emergency response guide)
ESS / BESS	Energy Storage System / Battery Energy Storage Management System
FACP	Fire Alarm Control Panel
IC	Incident Commander
ICS	Incident Command System
kW	Kilowatt(s)
kWh	Kilowatt-hour(s)
LFL / LEL	Lower Flammability Limit / Lower Explosive Limit
LFP	Lithium Iron Phosphate
MW	Megawatt(s)
MWh	Megawatt-hour(s)
O&M	Operations and Maintenance
PCS	Power Conversion System
PPE	Personal Protective Equipment
ROC	Remote Operations Center
SCBA	Self-Contained Breathing Apparatus
SDS	Safety Data Sheets
SME	Subject Matter Expert
SOC	State of Charge
UICS	Unified Incident Command System
UFL / UEL	Upper Flammability Limit / Upper Explosive Limit

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1 INTRODUCTION

1.1 Scope and Purpose

This Emergency Response Plan (ERP) is provided for the PROJECT battery energy storage system (ESS or BESS) facility located at 600 Central St in Holliston, MA 01746. The purpose of this document is to provide guidance and pertinent information regarding the roles, responsibilities, and chain of communication and command of the System Owner / Operator, Property Owner, and other required Subject Matter Experts (SMEs) for preparing for, and safely responding to, a fire, explosion, or other battery-related incident requiring a public safety response at the energy storage facility.

The Operations and Maintenance (O&M) Manager for the project is an employee of BlueWave. “On-site personnel” include all individuals on the facility property who are direct employees of the Owner / Operator or affiliated contractors. The Owner / Operator and contractors are similarly responsible for establishing and maintaining contractor-specific Emergency Response Plans and reporting procedures that will work in conjunction with the overall energy storage facility plan.

Life safety shall be the highest priority during any type of event.

1.2 Activation

This Emergency Response Plan shall be activated during any emergency response to a battery-related incident on-site.

1.3 Incident Command System (ICS)

The System Owner / Operator, Subject Matter Experts, Remote Monitoring Facility staff, and all energy storage system related personnel shall comply with the orders of the Incident Commander (IC) and the command staff.

1.4 Operations and Maintenance (O&M)

Operations and maintenance procedures for the energy storage facility and associated equipment is outside the scope of this document.

Please refer to manufacturer Operations and Maintenance manuals for all associated equipment related to the site prior to beginning any work on this installation.

1.5 ERP Update Process

1.5.1 Issuance and Revisions

Dates for draft issuance, revisions, and final issuance of this ERP are provided on Page 5 of this document.

Updates to this ERP based on any major material changes to the installation are the responsibility of the System Owner / Operator and other relevant entities required.

1.5.2 Annual Review

During the operating life span of this installation, it is expected that this document shall be reviewed annually, with all pertinent information updated as required.

2 SITE OVERVIEW

2.1 Site Location

The Holliston ESS facility is located at 600 Central St in Holliston, MA 01746. The site consists of thirty (30) Powin Centipede Stack750E energy storage system (ESS) enclosures (also referred to as “segments”) providing 4.99 MW / 19.96 MWh of energy storage power and capacity, respectively.

The site is located on an 8.51-acre parcel of land, with ESS portion of the site enclosed by chain link fencing around the perimeter of the site.

The site is not located in a Special Flood Zone (AE or E).

Figure 1 – Enlarged Site Layout

SITE INFORMATION	
Site Address: **600 Central St** Holliston, MA 01746	
GPS Coordinates: 42°11’54”N, 71°24’14”W	**Special Flood Zone:** XX

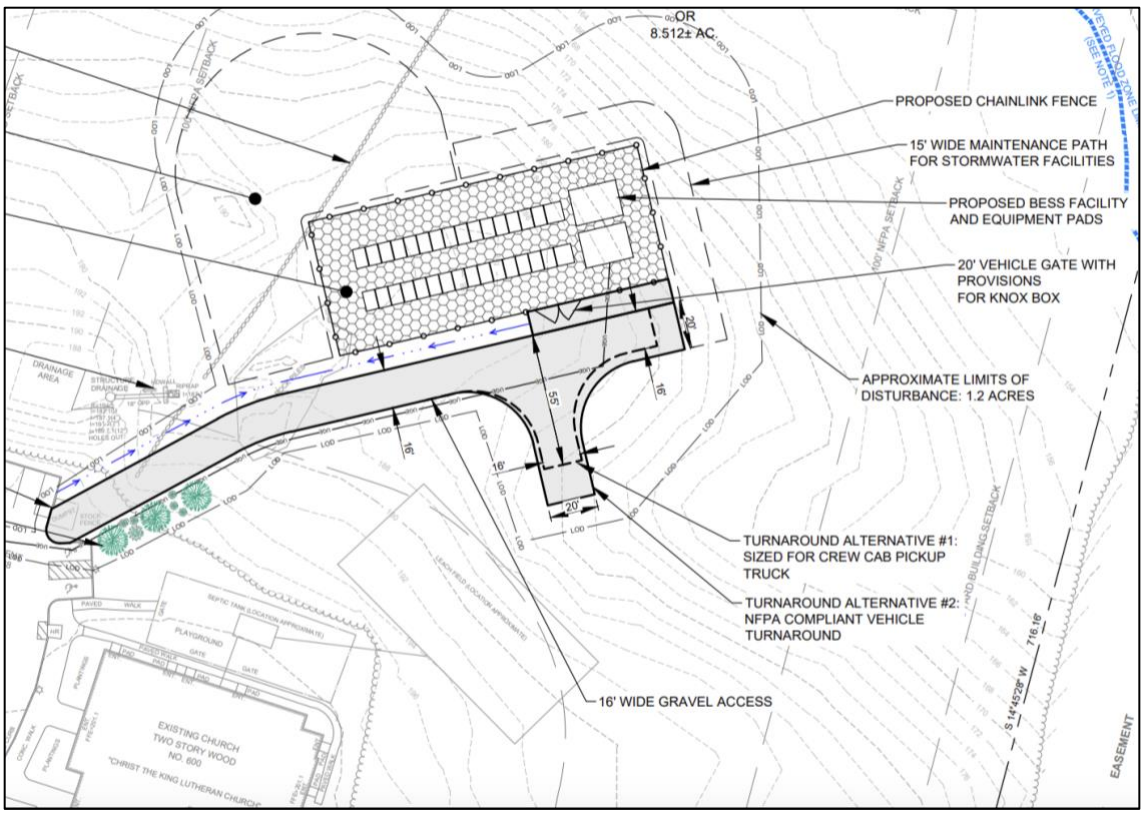
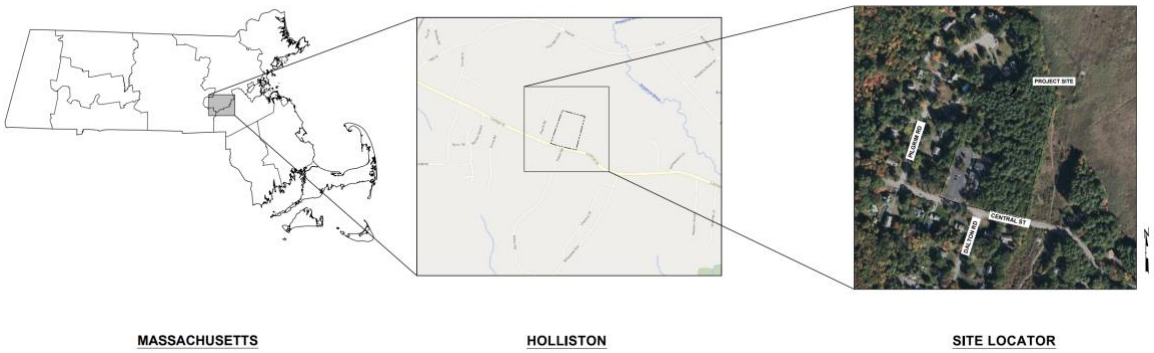


Figure 2 – Vicinity and Aerial View



2.2 Associated Electrical Equipment

- **Energy Storage System:** Powin Centipede Stack750E (x30 enclosures)
- **Inverters / PCS :** Sunny Central EV-series inverters / Power Conversion Systems (PCS) (x2)

2.3 Fire Department Staging Area

To be finalized prior to construction in consultation with Fire Department.

The Fire Department should not attempt to enter the site fence line unless there is clear threat to life safety.

2.4 Public Safety Staging Area

To be finalized prior to construction in consultation with Fire Department.

2.5 Site Access

The site is enclosed within protective chain link fencing with one gated entrance located on the southern side of the site (see Figure 2). As noted above, the Fire Department should not attempt to enter the site fence line unless there is clear threat to life safety.

2.6 Lock Box Access

A lock box containing a physical copy of the Emergency Response Plan (ERP), operational permits, O&M logs, product manuals, etc., is provided at the site entrance, as shown in Figure 2.

2.7 Fire Alarm Control Panel

The primary Fire Alarm Control Panel (FACP) is located LOCATION, as shown in Figure 2.

2.8 Equipment Access

The ESS enclosures are only accessible for maintenance purposes via cabinet-style enclosure doors and cannot be physically entered by personnel at any time.

The Fire Department should not attempt to open the enclosure doors at any time.

2.9 Water Supply

- **Primary Water Source:** all water shall be tanked on-site by Fire Department vehicles

2.10 Nearby Exposures

The following nearby exposures are located in the immediate area, as shown in Figure 1 above.

- **Existing Two Story Church**

  Chris the King Lutheran Church is located south of the site, approximately 165 ft from the nearest ESS unit. A gated playground is located on the northern side of the Church, approximately 125 ft from the nearest ESS unit. An associated parking lot is also in the vicinity.

- **Residential Homes**

  A number of residential homes are located NW of the site, approximately XX ft from the nearest ESS unit.

- **Eversource Utility Lines**

  Eversource-owned parcel with utility lines is located to the E, approximately XX ft from the nearest ESS unit.

2.11 Site Maintenance

The facility's interior access roads shall be maintained to guarantee accessibility to the site by emergency personnel, especially during inclement weather. BlueWave shall ensure snow removal, landscaping, and other ongoing upkeep activities are in place prior to construction.

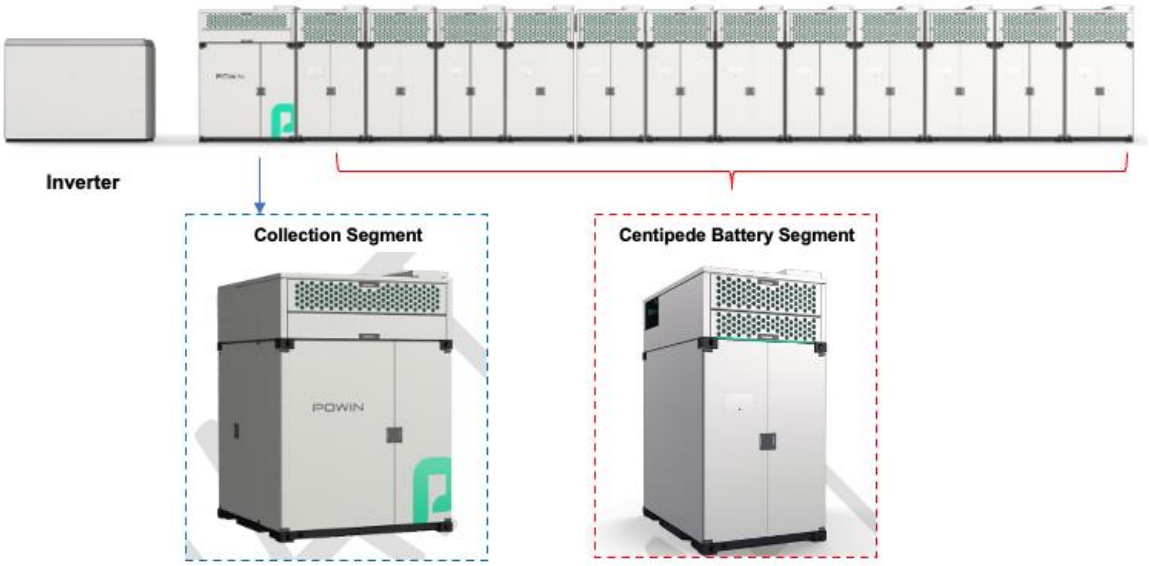
3 ENERGY STORAGE SYSTEM OVERVIEW

The Holliston energy storage facility utilizes thirty (30) Powin Centipede Stack750E ESS enclosures (also referred to as “segments”), each providing approximately 186.5 kW / 746 kWh per unit, thus providing a total of approximately 4.99 MW / 19.96 MWh of energy storage power and capacity to the electrical grid. Each Stack750E enclosure consists of 84 battery modules utilizing lithium iron phosphate (LFP) battery cells (840 cells in total).

Each Stack750E enclosure is equipped with one (1) heat detector, one (1) smoke detector, and one (1) gas detector, as well as an active exhaust ventilation system designed to exhaust flammable gases released during battery failure from the enclosure before explosive limits are allowed to accumulate.

Each row of 15 Stack750E segments is also provided with an associated Collection Segment which contains auxiliary transformer and cabling, circuit breakers for AC power connections, HVAC and heaters, UPS (for control power and communications), and networking equipment (shown in Figure 3 below).

Figure 3 – Typical Powin Centipede Stack750E Platform



Additional information on fire protection systems is provided in Section 4 below.

4 FIRE PROTECTION SYSTEMS

4.1 Explosion Protection Systems

Each Powin Centipede Stack 750E Battery Segment is provided with deflagration protection in the form of active and passive ventilation as described below:

- **Active Ventilation:** in the event that gases are detected in a Battery Segment, the HVAC ceases operation and eight (8) booster fans are activated to exhaust gases from within the enclosure to reduce flammable concentrations within the enclosure.
- **Passive Ventilation:** in the event that auxiliary and UPS fail during an active off-gassing event, the vents are shut open by means of a fail-open actuator allowing gases to be vented from the cabinet through natural buoyancy.

A safe stand-off distance of 100' shall be maintained between individuals and the ESS enclosure(s) exhibiting fire conditions. Staging of personnel and equipment shall be on the angles of the ESS enclosure to stay out of the potential blast radius of any enclosure doors or other possible projectiles.

WARNING: Risk of Explosion / Deflagration	
	An explosion / deflagration / over-pressure event is a critical hazard, and any emergency on-site should always be addressed with full awareness of potential factors which may lead to such an event. **Any failure or alarm condition should result in the assumption of an explosion risk.**

WARNING: Risk of Re-ignition	
	Do **NOT** assume the fire is out as the fire event unfolds. A lithium-ion battery fire which has seemingly been extinguished may flare up again if all cells within the enclosure have not been completely consumed.

4.2 Fire Suppression System

Each Powin Centipede Stack750E is equipped with a Stat-X aerosol fire suppression canister and is automatically activated upon heat or smoke detection within the enclosure.

Stat-X will NOT extinguish a lithium-ion battery fire and may only be effective in suppressing electrical component / wiring fires. Do not assume that a battery fire is extinguished once Stat-X is released.

WARNING: Risk of Re-ignition	
	Do **NOT** assume the fire is out as the fire event unfolds. A lithium-ion battery fire which has seemingly been extinguished may flare up again if all cells within the enclosure have not been

	completely consumed. The risk of battery re-ignition can remain present for hours or even days after the smoke / flame is initially detected.

WARNING: Risk of Explosion / Deflagration	
	An explosion / deflagration / over-pressure event is a critical hazard, and any emergency on-site should always be addressed with full awareness of potential factors which may lead to such an event. **Any failure or alarm condition should result in the assumption of an explosion risk.**

4.3 Emergency Shutoffs

In the event of a fire or other thermal event that has led to the activation of the Emergency Ventilation System, fire suppression system, or fire alarm system, the ESS should automatically go into an E-Stop that shuts down the system by disconnecting all DC power to the ESS product.

Automatic E-Stop is provided by any of the following:

- Hydrogen sensor (signals H2 concentration set point reached)
- Trouble signal (loss of AC power of lower battery voltage)
- Fire alarm (signals smoke and / or heat)
- Fire supervisory (signals tampering, low air, or high air)
- Door alarm (signals door is open)

If automatic shutdown does not occur, coordinate with the Site Operator, Powin's ROC, and other relevant first responders to determine if the system can be de-energized at a circuit breaker upstream of the system. **This activity should only be performed by trained corporate / utility personnel utilizing appropriate PPE.**

The Fire Department should not engage with E-Stops, as ESS shutdown may adversely affect the electrical grid. Any interaction with E-Stops should only be initiated in coordination with the System Owner, and other SMEs as is deemed necessary.

CAUTION: Risk of Stranded Energy	
	Shutting off power to the ESS unit(s) does not de-energize the battery and shock hazard may still be present. Always treat the batteries as Energetic Hazardous Materials, as they may maintain their State of Charge (SOC) long after the removal of power to the overall ESS.

WARNING: Risk of Fire and Explosion	
	Risk of fire or explosion may be present in the event of a battery failure. The Fire Department should not attempt to engage with any site or enclosure E-stops. Assistance in shutdown should be provided by the System Owner / Operator and any other required SMEs.

WARNING: Electrical Shock Hazard	
	In case of flooding, stay out of the water if any part of the ESS unit(s) or wiring is submerged.

4.4 Battery Management System (BMS)

An integrated Battery Management System (BMS) monitors key datapoints such as voltage, current, and state of charge (SOC) of battery cells, in addition to providing control of corrective and protective actions in response to any abnormal conditions. In the event of any abnormal conditions, the BMS will generally first raise an information warning, and then trigger a corresponding corrective action should certain levels be reached. Critical BMS sensing parameters include:

- Over / under temperature limits
- Over / under voltage limits
- Over / under current limits
- Communications loss

BMS data is also transmitted to the Powin Remote Operations Center (ROC), which may be accessed by the System Owner / Operator to provide critical information which may provide guidance to first responders arriving on-site (e.g., temperature trends may indicate if adjacent enclosures are reaching dangerous temperatures).

5 FIRE DETECTION, ALARMING, AND NOTIFICATION

5.1 Heat, Smoke, and Gas Detection

Each Powin Stack750E Battery Segment is equipped with one (1) heat detector, one (1) smoke detector, one (1) gas detector, and a manual “trigger” (emergency stop).

Furthermore, the Collection Segment is equipped with a Fire Control Panel (FCP) which communicates with the environmental controller and addressable fire safety system equipment in the Stack750E Battery Segments. The FCP activates horn and strobe in the event of a fire and sends the signal to the environmental controller to trigger necessary safety actions.

5.2 Alarm and Detection Signal Definitions

- **Supervisory Signal:** This is an indication that the fire detection or suppression system is experiencing a control issue. A special supervisory alarm will go off and a signal sent to the monitoring organization. The fire department need not be notified, and fire suppression should not be engaged.
- **Fire Alarm:** This is an indication that at least one detector (smoke, heat, manual) has been triggered. A single detector may not be enough to trigger fire suppression, but should always trigger local indicators (horns, flashing lights) and Powin monitoring indicators.
- **Fire Suppression Response:** This is the actual physical response to fire, triggered by one or more fire alarms.

5.3 System Configuration

- **Supervisory Signal:** If there is a supervisory signal, a supervisory indicator signal will be sent to Powin’s remote monitoring systems.
- **Manual Trigger:** If the manual trigger is tripped, an audible alarm and flashing light will activate locally, Powin’s remote monitoring system will indicate an alarm, and, after a delay of 60 seconds, the fire suppression response will begin.
- **Single Detector:** If a smoke, heat, or gas detector is tripped, an audible alarm and flashing light will activate locally and Powin’s remote monitoring system will indicate an alarm. Activation of a gas detector shall also automatically trigger the active exhaust ventilation system designed to remove flammable off-gases from the enclosure before explosive concentrations are able to develop. Fire suppression is not automatically triggered in response to a signal from a single detector.
- **Multiple Detectors:** If both smoke and heat detectors are tripped, fire suppression response will begin immediately, an audible alarm and flashing light will activate locally, and Powin’s remote monitoring system will indicate a fire suppression response.

5.4 Central Station Monitoring

In the event of heat, smoke, or gas detection, Alarm and / or Trouble signal(s) shall be transmitted to the Central Station which shall then be relayed to the local Fire Department who shall coordinate dispatch of responding units.

Table 1 – Central Station Monitoring Facility Information

Central Station Contact Information

- **Business Telephone:** (XXX) XXX-XXXX
- **Identification #:** XX

5.5 Remote Monitoring Facility

In addition to monitoring by the Central Station, remote monitoring of BMS operation is provided by the Powin Remote Operations Center (ROC). In the event of a battery-related failure transmitted by the BMS, alarm notifications and other pertinent information on the state of the ESS shall be sent to the System Owner to inform potential emergency response procedures as needed.

Additionally, if more detailed information on the state of the Stack750E ESS segments is required, the Powin ROC should be contacted.

Table 2 – Powin Remote Operations Center (ROC) Information

Powin Remote Operations Center (ROC)

- **24/7 Emergency Hotline:** +1 (855) 888-3659
- **Email Support:** service@powin.com

5.6 Additional Contact Information as Needed

Description

Table 3 – Description

Description

- **Emergency Hotline:**
- **Email:**

6 GENERAL HAZARDS ASSOCIATED BATTERY ENERGY STORAGE SYSTEMS

Lithium-ion battery failures pose several major risks, as are briefly described in the sections below. Specific response procedures for different incident scenarios are provided in Section 8 of this document.

6.1 Thermal Runaway

The defining characteristic of lithium-ion battery failures is a state known as thermal runaway. Thermal runaway is chemical process where self-heating in a battery exceeds the rate of cooling causing high internal temperatures, melting, off-gassing / venting, and in some cases, fire or explosion. Thermal, mechanical, and electrical abuse can lead to thermal runaway; internal short circuit from manufacturing defects; or the development of metallic dendrites that form an internal short over time.

Flammable and potentially explosive gases (generally white in color) typically evolve when an ESS goes into thermal runaway and may be released in large quantities from battery cells or modules. Fire and explosive incidents may result, and precautions as described in sections below should be observed.

6.2 Fire and Re-ignition

Lithium-ion battery fires burn extremely hot (upwards of 1,000 – 1,500°C) and are generally not easily extinguished. Fire growth may be slow, fast, or ultra-fast (e.g., during deflagration event) in nature, and may last for several hours before the battery modules are completely consumed. Furthermore, even when a lithium-ion battery fire appears to be fully-extinguished, re-ignition risk may still be present hours or even days after there is no visible signs of fire.

Application of water directly to affected battery modules may potentially prolong the incident, and decision to apply water should be made in coordination with the System Owner / Operator and any other required SMEs.

WARNING: Risk of Re-ignition	
	Do **NOT** assume the fire is out as the fire event unfolds. A lithium-ion battery fire which has seemingly been extinguished may flare up again if all cells within the enclosure have not been completely consumed. The risk of battery re-ignition can remain present for hours or even days after the smoke / flame is initially detected.

NOTICE	
	Indicators which may provide insight into what is happening or about to happen during an incident may include: ▪ Smoke or flames ▪ Change in smoke color ▪ Change in velocity or volume of smoke production ▪ Sounds – popping and / or hissing

	▪ Smell – sweet smell

6.3 Explosion

Lithium-ion batteries release flammable off-gases during thermal runaway which, if allowed to accumulate within the enclosure, may create an explosive atmosphere, posing serious risk to first responders and nearby exposures. These gases may accumulate within the ESS enclosure at levels above the Lower Explosive Limit (LEL). At sufficiently high accumulations, gases can also exceed their Upper Explosive Limit (UEL), at which point ventilation may bring the environment back into flammable limits, thus creating a new explosion risk.

It may be difficult to discern conditions within the enclosure if smoke and gas are not visible outside of the enclosure. Furthermore, a single battery cell may release enough flammable off-gas to generate an explosive atmosphere within the enclosure. Therefore, any failure or alarm condition should always result in the assumption of a potential explosion risk.

WARNING: Risk of Explosion / Deflagration	
	An explosion / deflagration / over-pressure event is a critical hazard, and any emergency on-site should always be addressed with full awareness of potential factors which may lead to such an event. **Any failure or alarm condition should result in the assumption of an explosion risk.**

6.4 Electric Shock

Even if a battery may look to be destroyed by fire and / or other means, there is potential that the battery still contains stranded energy and remains energized. De-energization of the system or any removal of the battery or battery component shall only be performed by a trained and competent individual with appropriate PPE.

Normal overhaul the ESS enclosure should not be attempted by the fire department in any circumstances, as there are considerations for handling damaged batteries requiring equipment and expertise not readily available. Once the scene is secured, these actions may be undertaken by trained experts under close supervision.

WARNING: Risk of Stranded Energy	
	Always treat the batteries as Energetic Hazardous Materials, as stranded energy is likely to remain present. Traditional Fire Department overhaul should not be conducted due to the potential for stranded energy.

6.5 Arc Flash

All ESS systems and related electrical equipment shall always be treated as energized (Energetic Hazardous Material).

Qualified PPE and training is required when working or accessing equipment within an Arc Flash Boundary. In general, when in direct proximity of the battery enclosure, wear non-melting or untreated natural fiber long-sleeve shirt, long pants, safety glasses, hearing protection, and leather gloves. AR plant clothing is also acceptable. Maintain arc flash boundary until completion of any particular task.

6.6 Toxic Smoke and Gas Emission

Lithium-ion batteries may release large quantities of flammable and toxic gas when undergoing failure and pose an inhalation hazard. Chemicals consumed during a thermal runaway event will produce copious amounts of smoke.

The ESS site perimeter should not be entered during a fire or off-gassing event unless there is an imminent threat to life safety, at which time only properly trained and equipped public safety personnel may enter. This entry shall be with full firefighter protective gear to include self-contained breathing apparatus (SCBA).

A fog pattern from a handline or monitor nozzle may be an effective way to control the off-gassing event on the exterior of the battery container from migrating to unwanted areas. However, if water is used in extinguishing flames, these gases can become acids which may cause skin irritation.

WARNING: Toxic Gases	
	Large quantities of toxic smoke and gas may be emitted from the ESS during battery off-gassing or fire situations. **Proper PPE including SCBA should be worn by first responders.**

NOTICE	
	Typical composition of battery off-gassing event may include: ▪ High concentrations (>10%) of Hydrogen, Carbon Monoxide, Carbon Dioxide ▪ Lower concentration (<10%) of Methane, Ethane, or other flammable hydrocarbons

7 EMERGENCY RESPONSE CONSIDERATIONS

7.1 Emergency Contacts

A list of emergency contacts associated with this installation are provided on Page 3.

7.2 Equipment and Personnel Protective Equipment (PPE)

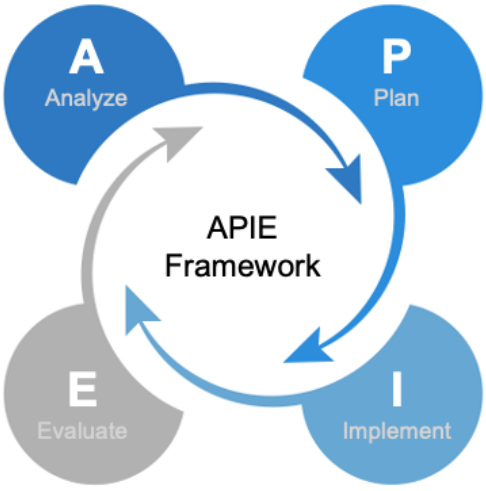
Full firefighter protective gear shall be worn in any response to a fire and / or explosion event or if there is any indication a fire may be present or likely to be present at any time during the event.

If there is no risk of fire or explosion present, arc-rated (AR) protective clothing to protect against arc flash and electrical shock shall be worn. Jewelry such as necklaces shall be removed to avoid contact with any electrical hazard.

Proper PPE shall include use of Self-Contained Breathing Apparatus (SCBA).

7.3 APIE (Analyze, Plan, Implement, and Evaluate) Framework

APIE is a framework commonly used for emergency incident preparation and development of appropriate response protocol(s). The four elements of the framework are Analyze, Plan, Implement, and Evaluate. An example APIE framework with simplified sample details pertaining to an emergency incident is as follows:



Analyze: Provide signs and monitoring signals that indicate incident escalation (e.g., fire or explosion) may take place which first responders should be aware of

Plan: Delineate the danger zone to mitigate risk to first responders and bystanders (pedestrians, vehicular traffic, etc.)

Implement: Once a plan is developed and proper resources and equipment installed, implement respective safety actions as deemed necessary.

Evaluate: Provide continuous monitoring and feedback of the incident and adjust accordingly to ensure ongoing safety of any bystander or responder in the impact area.

7.4 General Emergency Response Recommendations

Initiation of emergency response shall be activated per current protocol.

Table 4 - General Emergency Response Recommendations

General Emergency Response Recommendations:

1. **If there is any threat or potential threat to life or safety, 911 shall be called immediately to summon the aid of public safety responders.**
2. **An initial scene assessment shall be conducted from all sides** (360-degree scene size-up) if possible, and a clear concise assessment shall be given to incoming responders. Hazards and facility safety concerns such as high voltage areas or other electrical concerns shall be announced to all responders. The scene assessment shall include the following in plain language (no code or terms):
    - Where the incident is located
    - What has happened
    - What is occurring
    - Any injuries or unaccounted for individuals
    - What needs or other resources should be requested
3. **An Incident Command System (ICS) shall be established immediately and shall include designation of roles.** The primary command post location shall be located at the Fire Department Staging Area at the front of the site. If Public Safety is summoned to the incident, the ICS shall be a Unified Incident Command System (UICS).
4. **On-site staff (if applicable) shall immediately go to a designated muster point**, which will be the command post location unless designated differently by the Incident Commander.
5. **Incident Command shall designate the individual in charge of accountability.** Accountability shall be reported as soon as possible. If available, another individual shall control any traffic and guide first responders to the scene.

Note: At the same time as these activities are occurring, the System Owner / Operator or other designated SME shall immediately contact the Powin Remote Operations Center (ROC) to establish available data from the BMS and communicate this to the Incident Commander or other appropriate individual.

It is recommended that a safe perimeter is set up and maintained around the site to keep any persons or personnel a safe distance from the incident.

WARNING: Risk of Explosion / Deflagration	
	An explosion / deflagration / over-pressure event is a critical hazard, and any emergency on-site should always be addressed with full awareness of potential factors which may lead to such an event. **Any failure or alarm condition should result in the assumption of an explosion risk.**

WARNING: Toxic Gases	
	Large quantities of toxic smoke and gas may be emitted from the ESS during battery off-gassing or fire situations.

	Proper PPE including SCBA should be worn by first responders.

7.5 Determine Fire Protection Approach

Caution should be exercised if water is applied directly to the exterior of an affected ESS enclosure, as this will not stop a thermal runaway event and may potentially delay eventual combustion of the entire ESS product. Defensive firefighting tactics are generally recommended, with water being applied to nearby exposures for cooling, as necessary. Any hoseline operations should be limited to hose and master stream application from outside of the construction perimeter as far back as hose and stream ranges allow. The decision to provide thermal cooling via hoselines should be made in coordination with System Owner / Operator and any other required SMEs.

A fog pattern from a handline or monitor nozzle may potentially be utilized to control smoke and gases released from the affected enclosure and prevent them from migrating to unwanted areas.

In all instances, power shut down and isolation involving any high voltage feeder lines must be confirmed before any defensive measures are taken involving application of water to the site.

WARNING: Risk of Re-ignition	
	Do **NOT** assume the fire is out as the fire event unfolds. A lithium-ion battery fire which has seemingly been extinguished may flare up again if all cells within the enclosure have not been completely consumed. The risk of battery re-ignition can remain present for hours or even days after the smoke / flame is initially detected.

7.6 Incident Monitoring and Evaluation

Continuous monitoring and feedback on the incident should be provided as the situation evolves. Consultation with the System Owner / Operator and any other required SMEs should be held to guide incident response and determine appropriate next steps.

If available, real-time BMS data from the Powin Remote Operations Center (ROC) should be utilized (e.g., temperature, voltage, or other critical measurements) to monitor the spread of failure and assess the health of adjacent ESS units to help guide response procedures as the event unfolds.

8 INCIDENT SCENARIOS AND PROCEDURES

8.1 Explosion Incident

Lithium-ion batteries release flammable off-gases during thermal runaway which, if allowed to accumulate within the enclosure, may create an explosive atmosphere, posing serious risk to first responders and nearby exposures. Furthermore, it may be difficult to discern conditions within the enclosure if smoke and gas are not visible outside of the unit.

In case of fire or thermal runaway event, an explosive or deflagration event may occur potentially subjecting personnel to overpressure and projectile hazards. An initial exclusion area should be established, based on discretion of the Incident Commander, to guard against any blast overpressure. Fire Department staging or operations should not be in direct alignment with the ESS units and should be established at angles relative to the sides of the enclosures if possible. If available, shielding via the built environment should be utilized to protect against high temperatures, overpressure events, or projectile hazards.

A safe stand-off distance of 100' shall be maintained between individuals and the ESS enclosure(s) exhibiting fire conditions. Staging of personnel and equipment shall be on the angles of the ESS enclosure to stay out of the potential blast radius of any enclosure doors or other possible projectiles.

WARNING: Risk of Explosion / Deflagration	
	An explosion / deflagration / over-pressure event is a critical hazard, and any emergency on-site should always be addressed with full awareness of potential factors which may lead to such an event. **Any failure or alarm condition should result in the assumption of an explosion risk.**

8.2 Fire Incident

Upon detection of fire or excessive heat emanating from an affected ESS enclosure by the smoke or heat detectors, or BMS temperature monitoring, an audible and visual alarm shall be signaled at the Annunciator Panel. Smoke and flames may be visible from the outside of the ESS enclosure. Fire growth may be slow, fast, or ultra-fast (e.g., during deflagration event) in nature.

A safe stand-off distance of 100' shall be maintained between individuals and the ESS enclosure(s) exhibiting fire conditions. Staging of personnel and equipment shall be on the angles of the ESS enclosure to stay out of the potential blast radius of any enclosure doors or other possible projectiles. Attempt to extinguish the fire only if imminent threat to life safety exists.

If there is no immediate threat to life safety:

1. Allow the ESS to burn in a controlled fashion until all fuel sources inside are depleted.

2. A defensive approach should be considered utilizing water to cool and protect adjacent exposures and mitigate the spread of fire to areas outside of the fenced installation. Manage the fire incident utilizing the reach of the hose stream to protect exposures and control the off-gassing and smoke from the enclosure.
3. Remember that even after the ESS is isolated from the electric grid there may still be considerable stored energy in the batteries that poses a potential electric shock hazard to anyone in the nearby vicinity.

Additionally, chemicals released during a fire or explosion event will be in a gaseous form and primarily pose an inhalation hazard. A fog pattern from a handline or monitor nozzle may provide an effective means of controlling an off-gassing event on the exterior of the battery enclosure from migrating to unwanted areas such as public muster points, emergency responders, building intakes, etc.

Hose streams may be also applied to adjacent exposures for cooling purposes based on consultation with System Owner / Operator and other required SMEs. BMS data available via the Powin Remote Operations Center (ROC) should be closely monitored for the adjacent system(s) for any indicators of heat impact or water damage to any adjacent ESS units and relayed to the appropriate individual within the Incident Command System.

Following partial or complete consumption of the system by fire, batteries may continue to emit flammable gases and toxic gases for an extended period of time. Continuous monitoring of gas levels in and around the incident location is recommended. Full firefighter PPE and SCBA shall be utilized until gas levels are confirmed to be at a safe level. A Firewatch shall be provided to ensure the continued safety of the site after the situation appears stable.

WARNING: Risk of Re-ignition	
	Do **NOT** assume the fire is out as the fire event unfolds. A lithium-ion battery fire which has seemingly been extinguished may flare up again if all cells within the enclosure have not been completely consumed. The risk of battery re-ignition can remain present for hours or even days after the smoke / flame is initially detected.

8.3 Thermal Runaway or Off-Gassing Incident

A thermal runaway incident, as described in Section 6.1, is the characteristic failure mode of lithium-ion batteries. A thermal runaway event may begin suddenly, and the nature of the situation may evolve rapidly depending on a number of different factors. Combustion of flammable gases may result in fire or explosion, and considerations in Section 8.1 and Section 8.2 above should be observed based on the nature of the event as it unfolds.

A thermal runaway event may result in large quantities of smoke and gas being released, which may or may not be visible outside of the ESS enclosure itself; therefore, it is critical that any failure or alarm condition result in the assumption of an explosion or fire risk.

In the event of a thermal runaway or suspected off-gassing event, the following actions should be taken:

1. Evacuate the area to a safe location a sufficient distance from the troubled enclosure
2. If the alarm system has not already signaled the Fire Department, immediately call 911
3. Call any required Subject Matter Experts designated for the site
4. Call the Powin Remote Operations Center (ROC) listed on Page 3
5. Establish a safety perimeter around all sides of the ESS and remain outside the fenced area. Do not allow personnel other than firefighters in proper PPE to enter the safety perimeter and stay upwind of any smoke or off-gassing. (Note: the safety perimeter may extend beyond the boundary of the fenced area).
6. As the incident evolves, a fire or explosion event may occur, and procedures outlined in Section 8.1 and Section 8.2 above should be followed based on the situation as it progresses.

WARNING: Risk of Explosion / Deflagration	
	An explosion / deflagration / over-pressure event is a critical hazard, and any emergency on-site should always be addressed with full awareness of potential factors which may lead to such an event. **Any failure or alarm condition should result in the assumption of an explosion risk.**

WARNING: Risk of Re-ignition	
	Do **NOT** assume the fire is out as the fire event unfolds. A lithium-ion battery fire which has seemingly been extinguished may flare up again if all cells within the enclosure have not been completely consumed. The risk of battery re-ignition can remain present for hours or even days after the smoke / flame is initially detected.

WARNING: Toxic Gases	
	Large quantities of toxic smoke and gas may be emitted from the ESS during battery off-gassing or fire situations. **Proper PPE including SCBA should be worn by first responders.**

NOTICE	
	Indicators which may provide insight into what is happening or about to happen during an incident may include: ▪ Smoke or flames ▪ Change in smoke color ▪ Change in velocity or volume of smoke production ▪ Sounds – popping and / or hissing ▪ Smell – sweet smell

8.4 Alarm Incident

In the event of an alarm activation, the following actions should be taken:

1. Evacuate the area to a safe location a sufficient distance from the troubled enclosure
2. If the alarm system has not already signaled the Fire Department, immediately call 911
3. Call any required Subject Matter Experts designated for the site
4. Call the Powin Remote Operations Center (ROC) listed on Page 3
5. Establish a safety perimeter around all sides of the ESS and remain outside the fenced area. Do not allow personnel other than firefighters in proper PPE to enter the safety perimeter and stay upwind of any smoke or off-gassing. (Note: the safety perimeter may extend beyond the boundary of the fenced area).

8.5 External Fire / Thermal Exposure Incident

For any type of external heat source or fire impingement (i.e., not stemming from the battery system itself), the Incident Commander should be advised to look at the state of health information from the BMS data (e.g., increasing temperature in target ESS units) available from the Powin Remote Operations Center (ROC) to evaluate severity of the incident and treat as an ESS emergency. All precautions previously noted for fire and explosion incidents should be observed.

8.6 External Impact Incident

In the event that an enclosure is severely impacted causing crushing or puncturing of the outer shell of the enclosure, treat this as an emergency - notify 911 and other required parties.

9 POST-INCIDENT / HANDOFF PROCEDURES

9.1 Handoff Procedures

Description

9.2 Activation of Decommissioning Plan

Description

APPENDICES

APPENDIX A – Additional Site Photos

APPENDIX B – Signage / Placarding / IO Matrix

APPENDIX C – Annual ERP Review Log

The following table provides a log of reviews to be conducted on an annual basis for this Emergency Response Plan (ERP).

Date Conducted	System Owner Sign-Off	Notes / Comments