Alfred Oaks Energy Storage Facility

EMERGENCY RESPONSE PLAN

Rev. 2 | November 15, 2023

Summary

This document serves as the Emergency Response Plan (ERP) for the Alfred Oaks energy storage facility to be located at 4837 McAndrews Road in Alfred, NY.

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:

Northland Power Inc.
30 St. Clair Ave West, 12th Fl
Toronto, Ontario M4V 3A1

Energy Safety Response Group
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Delaware, OH 43015

www.energyresponsegroup.com
1-833-SAFE-ESS

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EMERGENCY CONTACT INFORMATION

IN CASE OF EMERGENCY CALL 911

LOCAL FIRE STATION

Alfred Fire Department (A.E. Crandall Hook and Ladder Company)

Phone: (607) 587-8800

Address: 4 South Main Street
Alfred, NY 14802

Dual Response Agreement With:

Alfred Station Volunteer Fire Department

Phone: (607) 587-9201

Address: 623 State Rte 244
Alfred Station, NY 14803

LOCAL POLICE DEPARTMENT

Alfred Police Department

Phone: (607) 587-8877

Address: 7 West University Street
Alfred, NY 14802

HOSPITAL EMERGENCY ROOM

Jones Memorial Hospital

Phone: (585) 593-1100

Address: 20 Main Street
Andover, NY 14806

LOCAL HEALTH FACILITY

Family Medicine of Alfred

Phone: (607) 587-8143

Address: 28 Church Street
Alfred, NY 14802

LOCAL BURN CENTER

Strong Memorial Hospital

Phone: (585) 275-8387

Address: 601 Elmwood Ave
Rochester, NY 14642

SYSTEM OWNER / OPERATOR

Northland Power

Phone: (416) 962-6262

Address: 30 St. Clair Ave West, 12th Fl
Toronto, Ontario M4V 3A1

24/7 REMOTE MONITORING FACILITY

Kingston Renewable Energy Center

Phone: 1-866-290-6992

Address: Address
Address

CENTRAL STATION

Central Station Monitoring

Phone: (XXX) XXX-XXXX

Address: Address
Address

SUBJECT MATTER EXPERT (SME)

Name

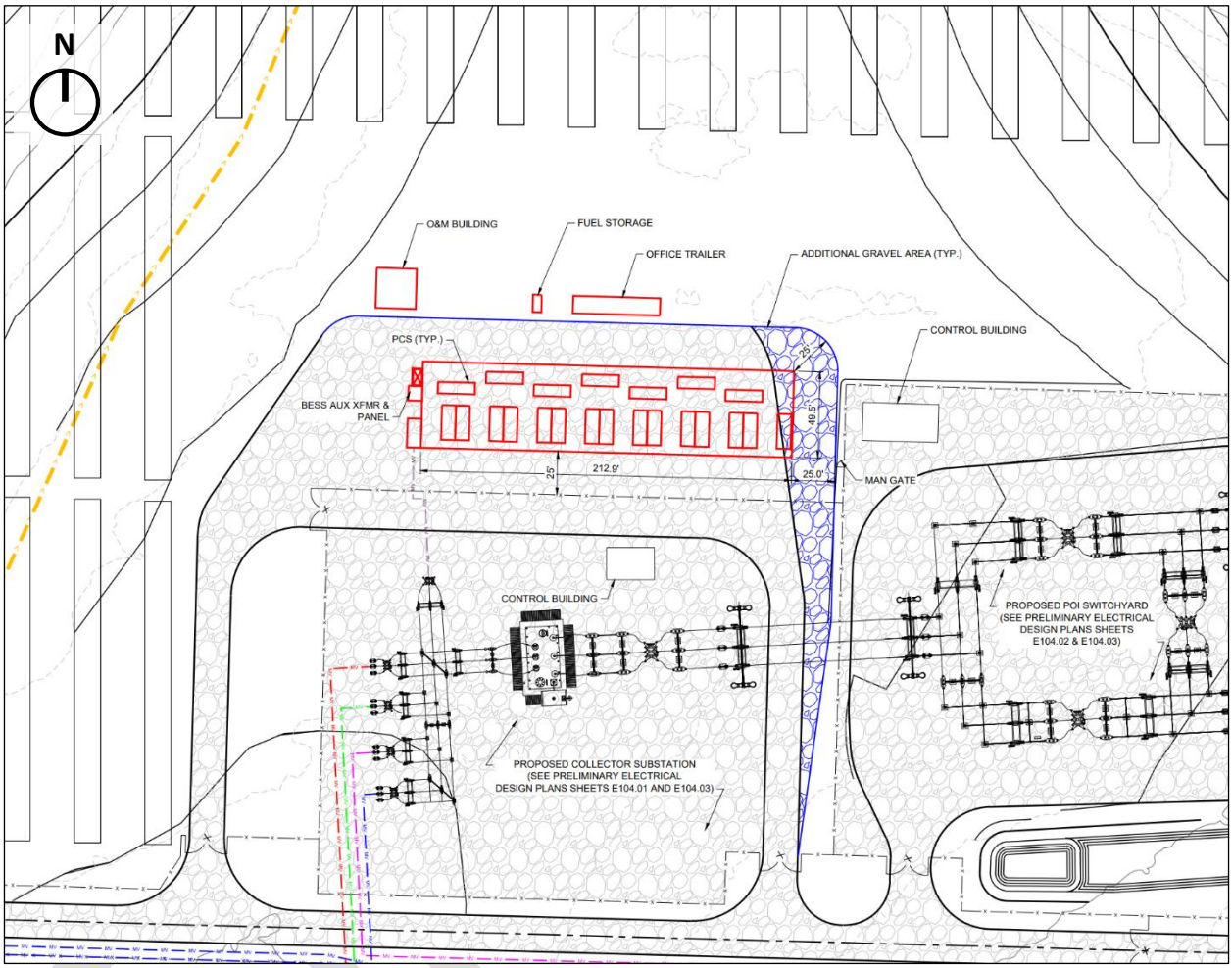
Phone: (XXX) XXX-XXXX

Address: Address
Address

ENERGY STORAGE SYSTEM INFORMATION

ALFRED OAKS ENERGY STORAGE FACILITY

4837 McAndrews Road, Alfred, NY 14802



ENERGY STORAGE SYSTEM

System: SolBank ESS
Model No.: CSI-SolBank-S-2967-2h-US
Total MW / MWh: 24.75MW / 49.5MWh (DC)
kW / kWh per Unit: 1,375kW / 2,750kWh (DC)
 # Units: 18

FIRE DETECTION SYSTEMS

Internal smoke and heat detectors trigger audio and visible alarms upon detection and automatically isolate affected batteries.

In event of fire detection, alarm signal is sent to TBD.

EXPLOSION PROTECTION SYSTEM

Active exhaust ventilation system is comprised of two (2) 200 CFM fans, triggered by combustible gas detection at 25% LFL of volume of enclosure.

AVAILABLE WATER SUPPLY

TBD

PROJECT INFORMATION

Project Name	***Alfred Oaks* Energy Storage Emergency Response Plan**
Project No.	23-20424
Prepared For	**Northland Power Inc.** 30 St. Clair Ave West, 12th Fl Toronto, Ontario M4V 3A1
Revision No.	Rev. 2
Document No.	23-20424-E-D2
Date of Issue	11/15/2023

REVISION HISTORY

Revision No.	Date of Issue	Substance of Change
Rev. 0	09/29/2023	Draft issue
Rev. 1	10/31/2023	Annual fire dept. training and logs
Rev. 2	11/15/2023	NYS ORES document requirements

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.*

Note 3: *TBD items are to be finalized prior to construction and are subject to change.*

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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)
ESRG	Energy Safety Response Group
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
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 Alfred Oaks battery energy storage system (ESS or BESS) facility located at 4837 McAndrews Road in Alfred, NY 14802. 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 Northland Power. “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, Maintenance, and Inspections

Routine operations and maintenance (O&M) and inspections of the BESS and associated fire protection equipment shall be performed by Northland Power or an authorized agent, in accordance with the long-term service agreement (LTSA), to be finalized in coordination with the OEM and provided prior to commissioning. A log of all maintenance, inspections and associated equipment testing shall be maintained onsite.

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.

A log of annual reviews is provided in Appendix C.

1.5.3 Plan Retirement

All decommissioning procedures should be performed by trained and knowledgeable persons in alignment with the Decommissioning Plan provided for this installation. Decommissioning shall be performed under supervision of the System Owner / Operator responsible for this installation.

Notification of decommissioning shall be provided to the Fire Department by the System Owner / Operator responsible for this installation.

1.6 Fire Department Training

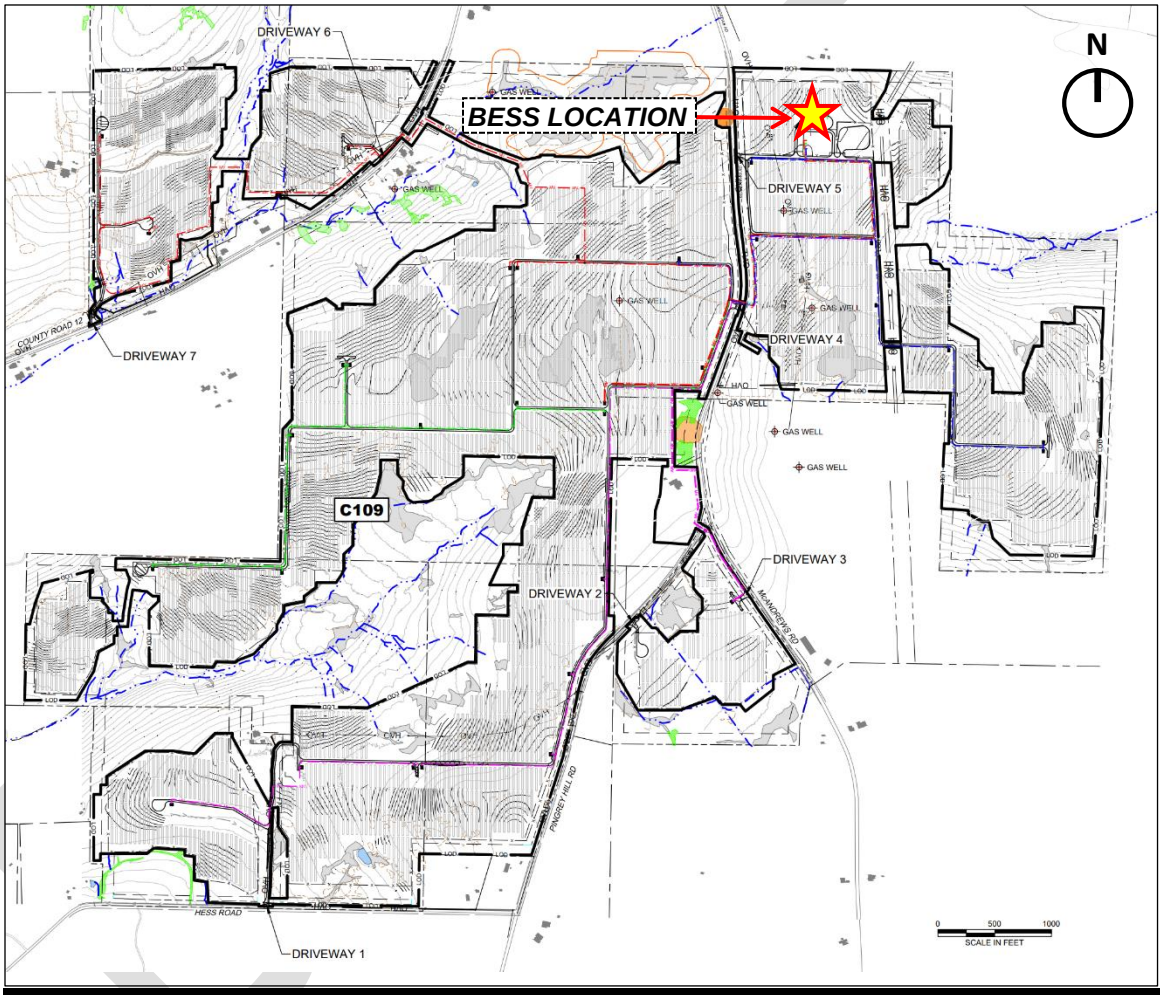
Trainings shall be organized in coordination with the local Fire Department and provided on at least an annual basis. Training material shall include, at minimum, familiarization of project equipment and site configuration details, established emergency procedures, and incident response scenario best practices; as well as any information as required by the Fire Department. A training log is provided in Appendix D.

2 SITE OVERVIEW

2.1 Site Location

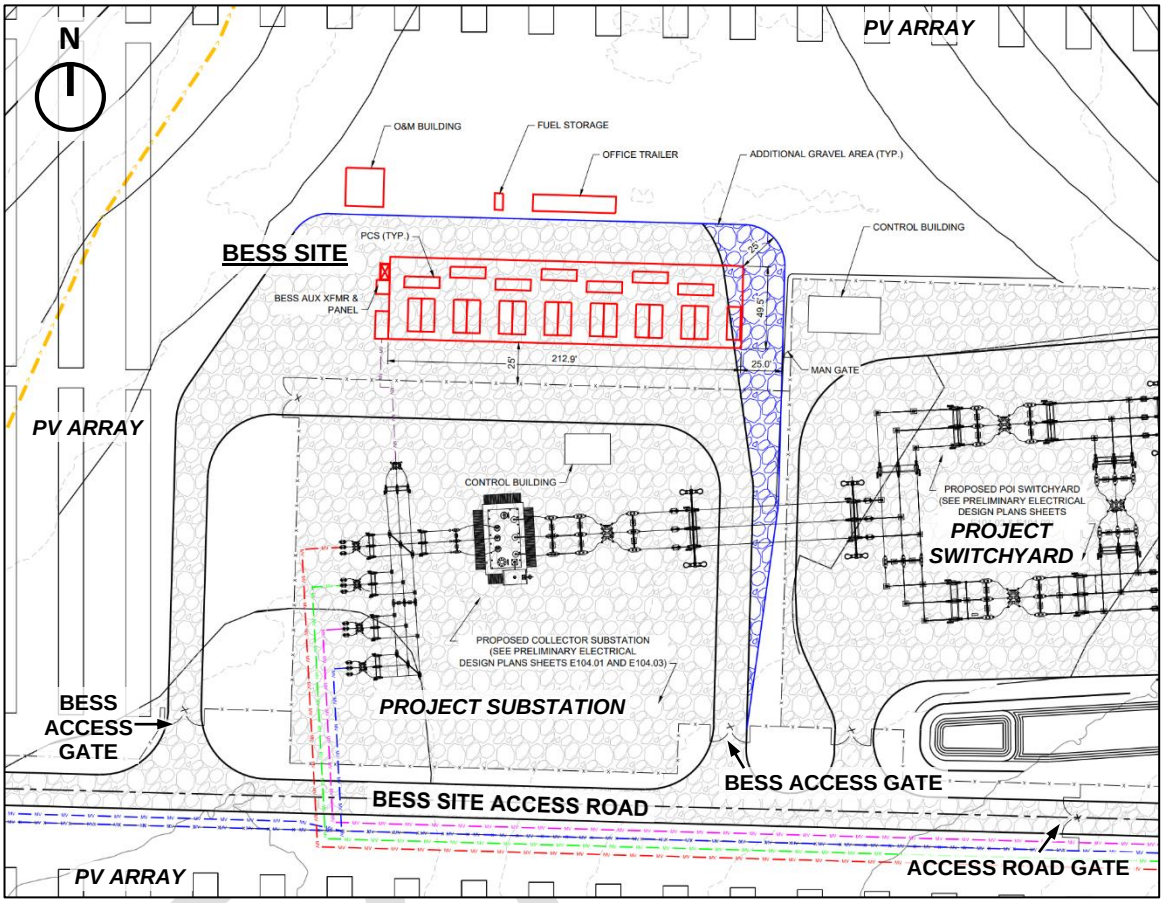
The Alfred Oaks ESS facility is located at 4837 McAndrews Rd in Alfred, NY. The site consists of eighteen (18) SolBank ESS units for a total rated system size of 24.75 MW / 49.5 MWh (DC nominal) of energy storage power and capacity, respectively.

Figure 1 – Site Vicinity Aerial



SITE INFORMATION	
Site Address:	**4837 McAndrews Road** Alfred, NY 14802
GPS Coordinates:	42°12'48"N, 77°48'36"W

Figure 2 – Enlarged BESS Site Layout



2.2 Associated Electrical Equipment

- **Energy Storage System:** (18) SolBank ESS units
- **PCS / Inverter :** (6) Power Electronics Freemaq Multi PCSM/PCSK
- **Solar PV Array:** The BESS facility is associated with a 100 MW solar farm. The BESS is sited toward the NE of the overall (approx. 590-acre) site (see Figure 1).

2.3 Fire Department Staging Area

Fire Department staging area is located along the BESS site access road outside of the BESS perimeter fence (see Figure 2). It is recommended that fire department staging areas are established at angles relative to the sides of the ESS enclosures to reduce potential impact from flying projectiles or debris in the event of an explosion event.

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

2.4 Public Safety Muster Points

Public Safety staging area is located outside of the overall project site along McAndrews Rd, as shown in Figure 1.

2.5 Site Access

The ESS equipment and site perimeter is to be secured against unauthorized access with fencing and locked entrance gates on the west provided for maintenance and emergency personnel (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 First Responders Station / Lock Box

A lock box containing a physical copy of the Emergency Response Plan (ERP), operational permits, O&M logs, product manuals, etc., is to be provided at the entry gate.

2.7 Fire Alarm Control Panel

The primary Fire Alarm Control Panel (FACP) is located in the O&M Building to the northwest of ESS units, as shown in Figure 2.

2.8 Equipment Access

Each battery container within an ESS unit are kept locked and only accessible for maintenance purposes via cabinet 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:** TBD

2.10 Nearby Exposures

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

- **Substation/Switchyard**

  The substation for the overall solar and ESS site is located directly south of the ESS, approximately XX ft from the nearest ESS unit.

- **Solar PV Array**

  The solar installation surrounds the ESS site on all sides, with electrical infrastructure separation distances on the south and east, as well as access roads to the west and south. The closest PV arrays to the west and north, are located approximately XX ft and XX ft from the nearest ESS unit, respectively.

- **McAndrews Road**

  McAndrews Road, the closest public road to the ESS site, is located to the west, approximately XX ft from the nearest ESS unit (and connect by a site access road).

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. Northland Power shall ensure snow removal, landscaping, and other ongoing upkeep activities are in place prior to construction.

3 ENERGY STORAGE SYSTEM OVERVIEW

The Alfred Oaks energy storage facility utilizes eighteen (18) CSI SolBank ESS units (which shall also be referred to as “SolBank” units throughout this report), each providing approximately 1375 kW / 2750 kWh per unit (DC nominal) at 2-hours duration, thus providing a total rated system of approximately 24.75 MW / 49.5 MWh of energy storage power and capacity to the electrical grid. Each SolBank unit consists of 48 battery packs, each populated with 69 lithium iron phosphate (LFP) battery cells.

Each SolBank unit is equipped with gas detection and an emergency ventilation system designed to exhaust any flammable gases released during battery failure before an explosive atmosphere can be generated within the enclosure.

A fire safety system, comprised of a heat detector and a smoke detector and integrated to a fire alarm control panel (FACP), as shown in Figure 4, triggers alarms, notifications, and isolates batteries and/or will shut down a unit in the event of a thermal event.

Figure 3 – Typical SolBank 2.0 ESS Unit

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

4 FIRE PROTECTION SYSTEMS

4.1 Exhaust Ventilation System

The SolBank ESS unit is integrated with an active exhaust ventilation system designed in accordance with *NFPA 69: Standard on Explosion Prevention Systems* to remove flammable off-gases during thermal runaway and maintain levels below 25% of the lower flammability limit of the volume of the enclosure.

The system consists of a gas detector to monitor for combustible off-gassing (H_2, CO, and CH_4) and two 200 CFM fans (400 CFM total), triggered upon detection of 25% LFL (Level 1) or 50% LFL (Level 2) of the volume of the enclosure. An NFPA 69 computation fluid dynamics (CFD) analysis conducted by TUV Rheinland determined SolBank explosion prevention system is capable of limiting the LFL below 25% during a failure event.

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 Emergency Shutoffs

Emergency shutoff is provided at multiple levels, though the Fire Department should not engage with E-Stops, as ESS shutdown may adversely affect the electrical grid.

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.

4.2.1 Automatic E-Stop

Automatic shutdown is provided depending on the type of failure:

- Batteries are automatically isolated via the BMS if faults are detected.
- PCS automatically disconnects from grid for out of range operating current/voltage

4.2.2 Enclosure-Level E-Stop

Each SolBank ESS unit is also equipped with two designated unit-level E-Stop buttons on the side of containers to shutdown individual units, or can be remotely activated.

In the event of a battery-related failure, the Fire Department should not approach any battery enclosures or engage with any enclosure E-Stops.

4.2.3 Site-Level E-Stop

XX (XX) manual Emergency Stop (E-Stop) / Emergency Power Off (EPO) switches are located at LOCATION, as shown in Figure 2.

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.

4.3 Battery Management System (BMS)

A Battery Management System (BMS) monitors key datapoints such as voltage, current, and state of charge (SOC) of battery cells, as well as corrective and protective actions in response to any abnormal conditions. Each SolBank unit is equipped with eight (8) BMS, each monitoring six (6) battery packs and wired to the central Distribution Management Cabinet (DMC) and SolBank Controller. 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

5 FIRE DETECTION, ALARMING, AND NOTIFICATION

5.1 Fire Detection

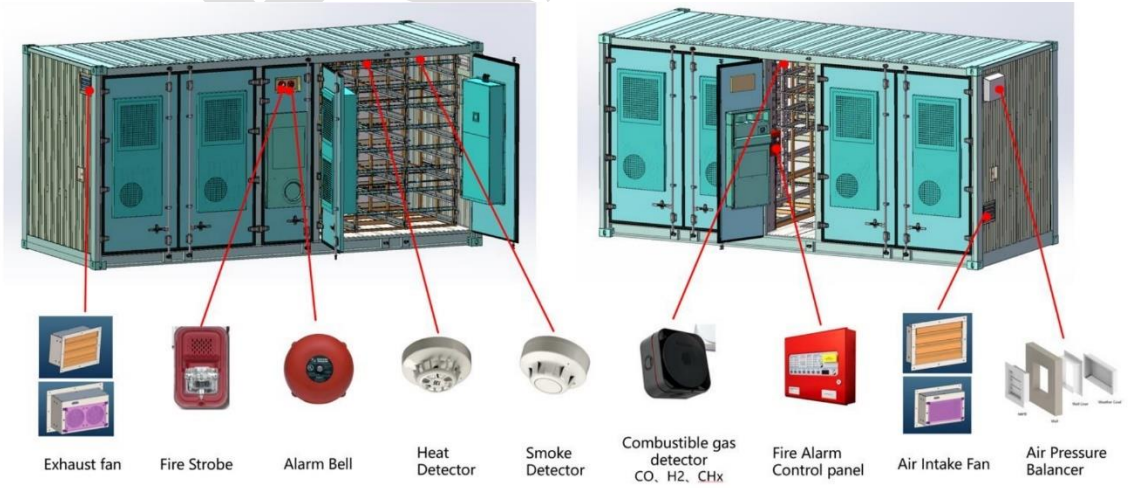
The energy storage facility is equipped with one smoke and one heat detector within every SolBank unit. In the event of a battery-related fire or thermal event emanating from the SolBank units, the fire detectors shall issue the following actions:

Actions Triggered Upon Fire Detection:

- Display and sound event at Control Panel
- Display and sound event at Annunciator
- Send alarm signal to BMS
- Activate horn strobe
- Send alarm signal to Central Station
- Send trouble signal to Central Station

Fire detection and monitoring systems are located in the Maintenance Building and seven Inverter Buildings, with the main fire system controls located in the Substation Control Building. When the main fire detection system is triggered (receives an alarm signal), it also raises an alarm in the Northland Power Kingston Renewable Energy Center Control Room. If a trouble or supervisory is activated, the NPI Control Room Operator will notify the NPI Solar Lead Technician immediately. In the event of a fire alarm, the NPI Control Room Operator notifies the corresponding ES (Fire, Police, or Ambulance) immediately and then the NPI Emergency Response Coordinator.

Figure 4 – Fire Safety System (Fire and Gas Detectors) Configuration



5.2 Central Station Monitoring

In the event of fire detection via heat and smoke detectors, the Central Station shall send Alarm and Trouble signals to the Central Station which shall then be relayed to the local Fire Department to coordinate dispatch of responding units.

Table 1 – Central Station Monitoring Facility Information

Central Station Monitoring Facility Name

- **Phone:** (XXX) XXX-XXXX
- **Additional Information:** TBD

5.3 Remote Monitoring Facility

In addition to monitoring by the Central Station, the Solar Facilities also have continuous monitoring of key operational parameters, including the BESS, and information is transmitted to the remote Kingston Renewable Energy Center, which provides 24/7 surveillance and emergency contact availability (an emergency contact phone number is also posted on the BESS facility's perimeter fence).

NPI Solar Operations personnel are the Emergency Response Team (NPI ERT) and will contact and coordinate with local Emergency Services (e.g. Fire, Ambulance, Police) when additional resources are required to deal with an emergency or unintended hazardous situation.

Table 2 – Remote Operations Center Information

Kingston Renewable Energy Center (for Emergency Use)

- **24/7 Emergency Hotline:** 1-866-290-6992
- **Email Support:** TBD

6 GENERAL HAZARDS ASSOCIATED WITH BATTERY ESS

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

6.7 Additional Hazards and Considerations

For additional hazards associated with leaked coolant, leaked refrigerant, leaked electrolyte, or emergency considerations during storage, operation, transportation, or first aid measures, and disposal procedures, please see product-level e-Storage (CSI) Emergency Response Guide.

7 EMERGENCY RESPONSE CONSIDERATIONS

7.1 Emergency Contacts

A list of emergency contacts associated with this installation, including local fire departments, are provided on Page 3.

7.2 Equipment and Personnel Protective Equipment (PPE)

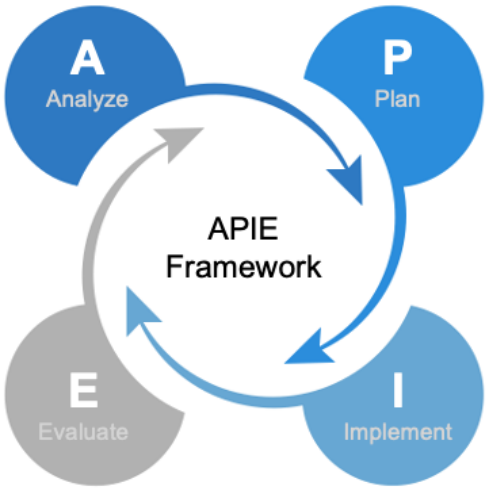
Full firefighter protective gear shall be worn in any response to a fire and / or explosion event or if there is any indication a fire may be present or likely to be present at any time during the event.

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 3 – 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 to immediately summon the aid of public safety responders, including local fire departments.
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, including local fire departments, 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.

Notes:

- At the same time as these activities are occurring, the System Owner / Operator or other designated SME shall immediately contact the remote 24/7 Kingston Renewable Energy Center 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 remote 24/7 Kingston Renewable Energy Center 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 at least 100 ft 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 heat and smoke detectors, 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 at least 100 ft 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 remote 24/7 Kingston Renewable Energy Center 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 remote 24/7 Kingston Renewable Energy Center 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 remote 24/7 Kingston Renewable Energy Center 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 remote 24/7 Kingston Renewable Energy Center 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 Remediation

Once an incident is determined to have concluded and there is no risk of fire or deflagration events, assessment of damaged battery energy storage system and other associated equipment shall be provided, and a final decommissioning plan provided for AHJ approval. De-activation, de-energizing, dismantling, and removal of the system shall be conducted by qualified personnel according to this plan and manufacturer recommendations. The fire department should not attempt to handle any damaged equipment.

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	Notes / Comments	System Owner Sign-Off

APPENDIX D – Annual Fire Department Training Log

The following table provides a log of annual Fire Department trainings.

Date Conducted	Participating Groups/Orgs	Attendance Count	Notes / Comments	System Owner Sign-Off