BLACKFORD RENEWABLES LTD

Fire Assessment Report

BLACKFORD ENERGY PARK 500 MW BESS

Date of issue:	6th May 2025
DOC Name:	Blackford Energy Park BESS Assessment Report
Version:	1.4.0
Transmission:	Public

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Version History

Ver.	Author	Change Description	Date	Sections Changed
1.0.0	J. Jackson	Initial document for review.	28/01/2025	All
1.1.0	J. Jackson	Updates following feedback from Project Manager.	11/02/2025	§3.3.3
1.2.0	J. Jackson	Updated to reflect latest fire strategy.	25/04/2025	Multiple
1.3.0	J. Jackson	Implemented changes identified by Project Manager.	29/04/2025	§4.1, §5.4
1.4.0	J. Jackson	Updated to reflect SHP comments.	06/05/2025	Multiple

Acronyms and Terms

Acronym/Term	Description
BEP	Blackford Energy Park
BESS	Battery Energy Storage System
BMS	Battery Management System
CCTV	Closed-Circuit Television
DSU	Disconnection Switch Unit
EC	Emergency Coordinator
EMS	Energy Management System
ERE	Explicit Risk Estimation
ERP	Emergency Response Plan
FAR	Fire Assessment Report
LFL	Lower Flammability Limit
NFCC	National Fire Chiefs Council
O&M	Operations and Maintenance
SM	Site Manager

References

Reference Name		Document Number / Detail
[R1]	National Fire Chiefs Council – Grid Scale Battery Energy Storage System planning – Guidance for FRS	Version 1.0 November 2022
[R2]	Safety of Primary and Secondary Lithium Cells and Batteries During Transport	IEC 62281: 2019

Reference Name		Document Number / Detail
[R3]	The Regulatory Reform (Fire Safety) Order 2005	-
[R4]	Standard for the Installation of Stationary Energy Storage Systems	NFPA 855
[R5]	Standard on Explosion Protection by Deflagration Venting	NFPA 68
[R6]	Energy Storage Systems and Equipment	UL 9540
[R7]	ANSI/CAN/UL Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems	UL 9540A
[R8]	Electrical energy storage (EES) systems - Part 5-1: Safety considerations for grid-integrated EES systems - General specification.	IEC TS 62933-5-1:2017
[R9]	Electrical energy storage (EES) systems - Part 5-2: Safety requirements for grid-integrated EES systems - Electrochemical-based systems	IEC 62933-5-2:2020
[R10]	Electrical energy storage (EES) systems Part 5-3: Safety requirements when performing unplanned modification of electrochemical based EES systems.	IEC 62933-5-3
[R11]	Health and safety in grid scale electrical energy storage systems (FrazerNash Consultancy)	https://www.gov.uk/government/publications/grid-scale-electrical-energy-storage-systems-health-and-safety/health-and-safety-in-grid-scale-electrical-energy-storage-systems-accessible-webpage

1 Purpose

1.1.1.1 This Fire Assessment Report (FAR) has been conducted for the Blackford Energy Park (BEP) Battery Energy Storage System (BESS) located near Rothienorman Substation in Aberdeenshire. The purpose of this assessment is to identify potential fire hazards, evaluate the level of risk associated with these hazards, and recommend measures to mitigate and manage these risks effectively.

1.1.1.2 The Blackford Energy Park BESS will play a critical role in the energy infrastructure of the region, providing essential support to the national grid. As such, it is imperative to ensure that adequate fire safety measures are in place to protect personnel, property, and the surrounding environment.

1.1.1.3 The scope of this FAR covers both the construction and operational phases of the project. Subsequently, this FAR considers various contributing factors including:

- Site location and equipment configuration,
- Separation between equipment,
- Construction materials proposed, and,
- Operational and maintenance procedures.

1.1.1.4 Relevant fire safety legislation, industry best practices, and guidelines set forth by regulatory authorities have also been considered as part of this FAR.

1.1.1.5 A review of the fire hazards relevant to the Blackford Energy Park BESS has been undertaken; subsequently, a number of mitigating strategies have been developed to detect, and respond to, potential fire incidents effectively.

1.1.1.6 The formal capture of all hazards identified by this Fire Assessment Report is to be found in Appendix A of this document.

1.1.1.7 This report demonstrates that all hazards related to fire at Blackford Energy Park BESS have been appropriately managed, with mitigating actions and expected validation activities identified. Full validation of fire detection and monitoring system functionality will be required as part of on-site testing in order to ensure the as-built systems function as designed.

1.1.1.8 The fire safety protocols developed with reference to this report, as well as other operational procedures, must be adhered to by all stakeholders involved in the operation and maintenance of the site. This includes owners, operators, emergency responders, and regulatory authorities.

2 Site Details

2.1.1.1 The proposed development site is located on agricultural land adjacent to the existing Rothienorman Substation at Rothienorman, Aberdeenshire, AB51 8YN.

2.1.1.2 The site is bounded to the north, east, and south by agricultural and pastureland, including residential dwellings in the form of farm cottages. The pre-existing Rothienorman sub-station site is adjacent to the site, to the west.

2.1.1.3 The development consists of the installation of a new battery energy storage system facility. The development will include battery units, inverters, back-up transformers and grid transformers.

2.1.1.4 The proposed equipment to be utilised is as tabulated below. Details required by the NFCC Grid Scale BESS Planning Guidance (November 2022) [R1] have also been provided where applicable.

2.1.1.5 Equipment details are currently indicative and are subject to change as the project progresses into the detailed design stage. Any substantial changes to equipment must be reviewed and any additional risk introduced by such changes must be appropriately managed.

Equipment	Number
20ft ISO Battery Containers [5.26 MWh per Unit]	332
Battery Chemistry: Lithium Ion Form Factor: Prismatic Type: Container Layout Configuration: See Figure 1 overleaf. Battery unit pairs are situated at least 3m from all other equipment. Fire Safety Systems: Smoke and gas detection; horn and strobe alarm; DC and auxiliary AC connection interlocking; direct cooling agent injection; dry pipe and water sprinkler suppression system; deflagration panels; communications with fire panel; and active venting system.	
Inverter, Power Conversion System [4.6 MVA per Unit]	138
33kV Transformer [4.6 MVA/0.69 kV/33 kV per Unit]	138
33kV Switchgear	9
Control Rooms	6
Emergency Diesel Generators	9
Supergrid Transformer [230 MVA / 33 kV / 33 kV / 400 kV per SGT]	3
Amenities Building	1

2.1.1.6 The proposed arrangement is detailed in Figure 1 below.

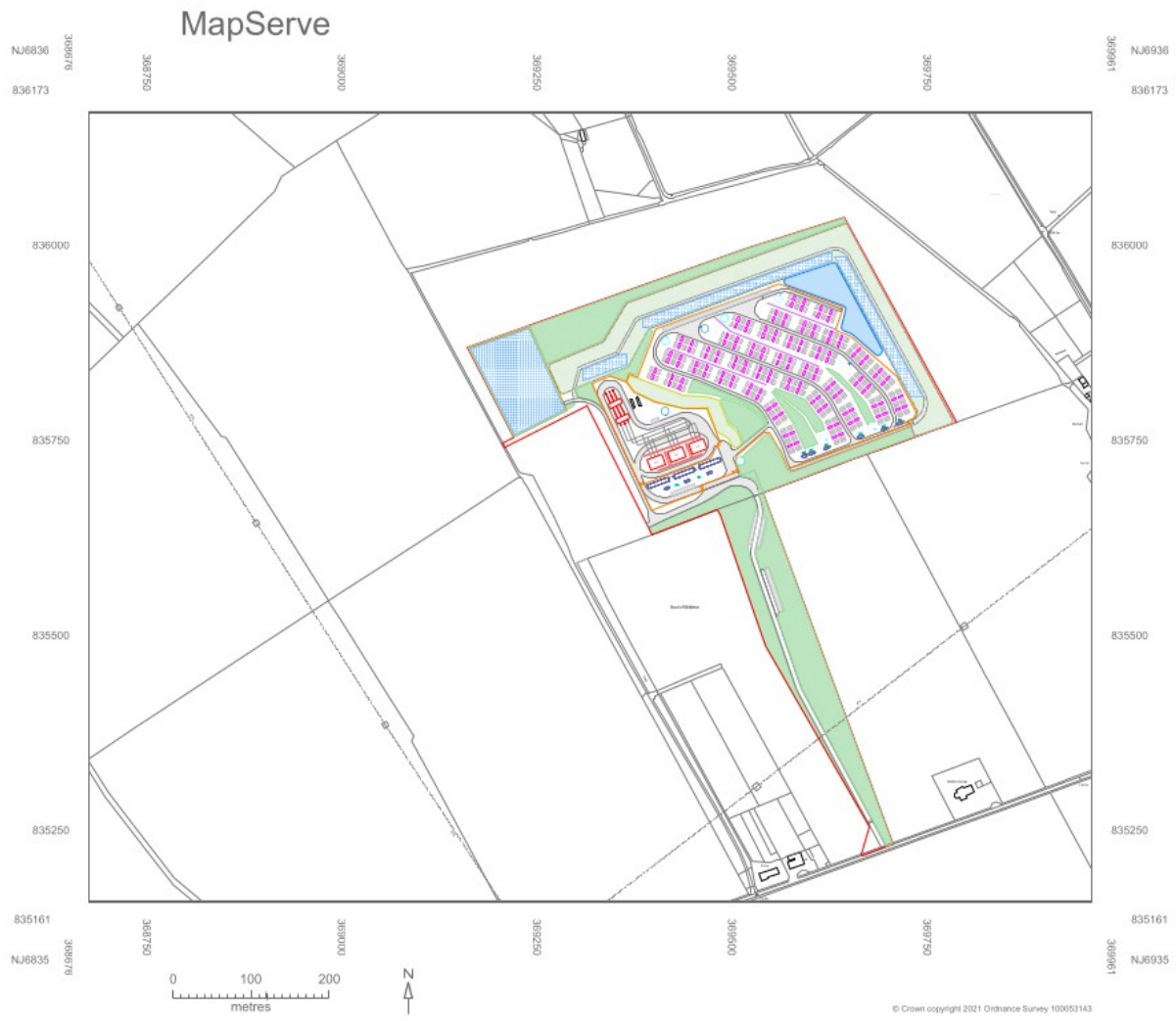

Figure 1: Proposed Blackford Energy Park Site Layout

2.1.1.7 The boundary of the project area, and thus the scope of this FAR, is defined by the red-line boundary as per the above figure.

2.1.1.8 There are a number of residential dwellings near to the proposed BESS development, located at the following distances away from the site fence perimeter:

- Westfield Croft (260m),
- Fyvie (270m),
- Middleford Grange (470m),
- Kininvie (500m).

2.1.1.9 In additional, Middleton Woods is located directly south of the proposed site. This area is to be considered as part of this Fire Assessment Report as a potential source of fire propagation.

2.1.1.10 There is an overhead transmission line located just over 300m away from the site's southern fence line. As this is considerable distance away from the proposed development, this shall not be considered as a potential source of ignition for this FAR.

3 Fire Hazard Contributions

3.1.1.1 The following sub-sections provide a summary of equipment, materials, and affected persons which have been used to define the fire hazards associated with the Blackford Energy Park BESS development. This includes the identification of sources of ignition and propagation; the potential causes for a fire hazard arising; as well as the persons affected in the case of an ignition event.

3.1.1.2 All hazards subsequently identified in this risk assessment document are further detailed in Appendix A – Blackford Energy Park Fire Hazard Log.

3.2 Hazard Sources (Ignition and Propagation)

3.2.1 Identification of Heat Ignition Sources

3.2.1.1 The table below outlines the potential sources of ignition within the Blackford Energy Park BESS site, as well as example events which may lead to such ignition.

Ignition Source	Detail and Site Configuration	Example Method of Ignition
Battery Container	332 battery units on concrete foundations around the site (outside)	Thermal runaway initiated by short circuit. Risk of short circuit exasperated by overcharging, overheating, mechanical abuse, and/or failure of Battery Management System.
Electrical Equipment	138 Inverters (PCS), 138 transformers, 3 Supergrid Transformers, and 9 switchgear located around the site upon concrete foundations (outside).	Malfunction, human error, overheating, or electrical surge may lead to equipment failing and igniting.
Electrical Distribution	Cables and connectors used for electrical distribution between site equipment.	Damaged cable insulation leads to excess current and overheating.
Electrical Devices	Laptops, chargers, printers, lighting, etc. located inside control buildings.	Damaged cable insulation leads to excess current and overheating, or device battery undergoes thermal runaway.
Backup Diesel Generator	9 diesel generators mostly situated near southern boundary (outside).	Combustion of fuel during operation.
Weather	Lightning strikes in the case of severe weather conditions.	Lightning strike ignites flammable material.
Human Factors	Members of staff, visitors, or trespassers.	Malicious or accidental ignition of materials on-site. Smoking, arson, littering, bonfires, etc.

3.2.2 Identification of Propagating Materials

3.2.2.1 This sub-section below outlines the materials on site which have potential to ignite or otherwise contribute to the spread of fire. These have been separated as follows:

- Flammable Materials – Those materials whose flashpoints are below ambient conditions (i.e. contact with flame will cause ignition without prior heating).
- Combustible Materials – Those materials whose flashpoints are above ambient conditions (i.e. a source of heat is required before ignition may occur).

3.2.2.2 The table below outlines those materials on site identified as flammable.

Flammable Material	Location or Related Equipment	Comments
Diesel	Diesel generators	Fuel will be handled during generator refuelling activities.
Oil	Transformers	On-site transformer oil used for cooling and insulation.
Battery Cells	Battery containers	Used for main site function of energy storage.
Paints	COSHH area	Used for maintenance activities.

3.2.2.3 The table below outlines those materials on site identified as combustible. Note that the following materials are predominantly found in amenity, control, storage, and monitoring buildings where staff reside.

Combustible Material	Examples
Vegetation	Dry grass, brush, weeds, unirrigated or dead trees.
Paper	Drawings, site procedures and registers, documentation, notebooks, posters, etc.
Cardboard	Storage boxes, signage, and labelling.
Textiles	Clothes and PPE used on-site.
Plastics	Plastic sheeting.
Furniture	Chairs, tables, shelves, desks, etc.
Waste	Food wrappers, general rubbish, and organic waste.
Office Devices & Supplies	Pencils, markers, printers, laptops, computers, etc.

3.3 Persons at Risk

3.3.1.1 This section identifies the persons at risk in the event of an ignition and subsequent fire propagation.

3.3.1.2 Those persons affected by identified fire hazards, as well as the appropriate mitigating actions, shall vary depending on the relevant project phase. As this FAR considers both the construction and operational phases of the project, the following subsections are separated accordingly.

3.3.2 Construction Phase

3.3.2.1 The majority of the project workforce will be mobilised during the construction phase, leading to a significant number of personnel being present on-site.

3.3.2.2 Comprehensive fire safety measures will be implemented on-site, including but not limited to, the installation of fire extinguishers, regular fire drills, and the designation of fire-watch personnel.

3.3.2.3 Emergency Response Plans (ERP) shall be established and communicated to all workers to ensure timely and efficient evacuation in case of a fire on-site. Fire safety measures will also be implemented during transportation of the batteries to site, in accordance with IEC 62281 standard [R2].

3.3.2.4 The persons at risk during the construction phase are identified and tabulated below.

Persons at Risk	Location	Reasons for Presence
EPC Site Manager and Technicians	Entire site.	Carrying out of inspections, site visits, and preventative maintenance.
Visitors	Specific areas designated as safe for visitors which will vary during the projects lifetime.	Site visits.
Contractors	Entire Site, however, this shall be dependant on the specific contractors' scope of works.	Carrying out specified construction or maintenance works.
Local Authorities	Specific areas designated as safe for visitors which will vary during the projects lifetime.	Local authorities including HSE, Fire Brigade, Law Enforcement, etc.
Members of the Public	Off-site.	Local residents and non-residents within vicinity of the BESS development.

3.3.3 Operational Phase

3.3.3.1 During the operational phase, the BESS site will be remotely monitored and does not require permanent occupancy for operation. However, it is expected that there will be intermittent presence on-site from maintenance contractors (average of 1 – 2 members of staff) to perform scheduled duties.

3.3.3.2 The exposure to risk is therefore highly limited during the operational phase.

3.3.3.3 This site shall be monitored and configured remotely via a closed-circuit television (CCTV) system. Maintenance functions will require technicians and engineers on site for both preventative and reactive maintenance.

3.3.3.4 The persons at risk during the operational phase are identified and tabulated below.

Persons at Risk	Location	Reasons for Presence
O&M Contractor and Technicians	Entire site.	Carrying out of inspections, site visits, and preventative maintenance.
Visitors	Specific areas designated as safe for visitors which will vary during the projects lifetime.	Site visits.
Contractors	Entire Site, however, this shall be dependant on the specific contractors' scope of works.	Carrying out specified construction or maintenance works.
Local Authorities	Specific areas designated as safe for visitors which will vary during the projects lifetime.	Local authorities including HSE, Fire Brigade, Law Enforcement, etc.
Members of the Public	Off-site.	Local residents and non-residents within vicinity of the BESS development.

4 Mitigating Actions and Fire Safety Provisions

4.1 Standards and Guidance

4.1.1.1 The following standards and guidance have been, and shall continue to be, considered when determining fire safety provisions:

- The Regulatory Reform (Fire Safety) Order 2005 [R3]: The applicable order related to fire safety in non-domestic premises, including work sites and power generation / storage system sites.
- The NFPA 855 (Standard for the Installation of Stationary Energy Storage Systems) [R4] and NFPA 68 (Standard on Explosion Protection by Deflagration Venting) [R5].
    - An NFPA 855 / 68 Compliance Assessment shall be provided by the battery manufacturer to demonstrate product compliance with the NFPA-855 and NFPA-68 standards.
- Recommendations provided by emergency services.

4.1.1.2 The assessment shall include details of the battery unit tests carried out in accordance with UL 9540 [R6], UL 9540A [R7], and NFPA 855 [R4] standards.

4.1.1.3 The battery manufacturer's manuals shall provide detailed information regarding warnings from smoke and heat detectors, responses following a warning, and the maintenance requirements applicable to the protection system.

4.1.1.4 A summary of all expected fire safety functions for the battery container is provided below.

Fire Safety Function	Description	Relevant Standard Compliance
Detection and Alarm	Smoke detection to alarm stage: (1) Addressable fire control panel to external horn + strobe light or other alarm system (2) Fire control panel to alarm (3) Shut-down (by load disconnect switch) CCTV cameras shall provide full site coverage, and shall be equipped with thermal imaging and alerting.	Compliant to NFPA 855 and NFPA 72 at enclosure level
Propagation Prevention	Direct cooling injection. *To hinder fire propagation between battery cells/modules (not suppressive).*	UL1973 (cell and module level) UL9540 and UL9540A (Installation level)

Fire Safety Function	Description	Relevant Standard Compliance
Suppression	Dry Pipe Sprinkler Design *To allow for effective fire suppression by the fire department in case of absolute emergency.*	NFPA 13
Explosion Control	Deflagration panel on the roof *To release build up of internal pressure in an upwards direction, away from neighbouring equipment.*	NFPA 68
	Active venting system with gas detection and exhaust fan (optional) *To maintain the concentration of gas below the lower flammability limit (LFL).*	NFPA 69

4.2 Roles, Responsibilities, and Competence

4.2.1 Construction Phase

4.2.1.1 The Site Manager (SM) is the appointed Emergency Coordinator (EC), with the responsibility of coordinating emergency evacuation at the worksite. The responsibilities of the SM as EC will be included in the Emergency Response Plan.

4.2.1.2 The Emergency Coordinator (EC) is responsible for ensuring that, in the event of an emergency, the Emergency Response Plan is followed, sounding an air horn to ensure that the workforce and visitors evacuate the site and assemble at the approved muster point.

4.2.1.3 The EC shall be able to communicate in English, ensuring effective communication with all staff on site, give instructions, and determine the type of emergency scenario, location, and details in case any emergency call is received.

4.2.1.4 The EC and the appointed first aider(s) shall work cooperatively to facilitate first aid and contact the emergency services if required. The EC must have knowledge of where both the extinguishers and additional emergency resources are located. They will have access to the sign-in register to carry out the roll call, ensuring that all the staff on site are evacuated and assembled at the muster point. EC details (name and phone contact) shall be given in the site induction and displayed on site (safety board, canteens or offices).

4.2.1.5 The EC must, as part of their general duties:

- Answer an emergency call and upon determining the emergency scenario, proceed with the emergency response procedure. Each scenario requires different steps that must be taken into consideration.

- Ensure that all the staff are evacuated from the site emergency scene and that they are directed to gather at the assembly point.
- Contact the Emergency Services or authorities if required (999).
- Ensure that the site is safe before returning to work after an emergency.
- Coordinate the Deputy EC to support during emergencies or in case of accident.
- Follow the report procedure.

4.2.1.6 During the phases where the facilities are installed, and an increased number of personnel are on-site, there will be an appointed Deputy EC. The Deputy EC will support the EC during an emergency following the EC's instructions.

4.2.1.7 The Deputy EC shall be suitably competent and shall be trained in both fire marshalling and first aid.

4.2.1.8 The Deputy EC must be familiar with the site and ongoing activities.

4.2.1.9 The Deputy EC will deputise for the EC if the EC is absent or otherwise unavailable to perform their duties.

4.2.1.10 All personnel on site shall be made aware of the Deputy EC during the site induction. If a new Deputy EC is appointed, site staff will be informed at a toolbox talk and on-site H&S panel board.

4.2.2 Operational Phase

4.2.2.1 During the operational phase, the O&M contractor manager is assigned the role of Emergency Coordinator (EC). The responsibilities of the O&M contractor manager as EC are to be included in the Emergency Response Plan.

4.2.2.2 The O&M contractor will be responsible for contacting the local fire and rescue service to coordinate the intervention in the case of a fire.

4.3 Fire Detection & Alarm

4.3.1.1 Sensors on site shall be used to detect the early stages of an unexpected thermal event (temperature increase, equipment malfunction, smoke, thermal runaway, etc.), which if left unresolved may lead to battery container ignition.

4.3.1.2 The following detection methods shall be utilised:

- **Temperature sensors:** Temperature sensors shall be operative in the battery units, transformer substations, and control substations.
- **Photoelectric smoke detectors:** Smoke detectors shall be installed within each battery container, customer substation, and monitoring room.
- **Pressure sensors:** These shall installed for all site-wide transformers, including the auxiliary transformer.
- **Visual Confirmation:** CCTV cameras shall provide full site coverage, and shall be equipped with thermal imaging and alerting (for the purposes of detecting abnormal heat characteristics and fire). The CCTV system shall be monitored, remotely and continuously, by O&M personnel.

4.3.1.3 The general detection logic and alarming for an event shall be as follows:

1) Smoke is detected by sensors installed within the battery container or building.
2) The central fire control panel initiates the external horn and strobe warning system (or other suitable alarm system).
3) Emergency trip circuits will activate, including the disconnection Switch Unit (DSU) on the DC busbar and MCCB for the auxiliary AC line. These shall open to electrically disconnect the battery supply from all external sources.
4) The HVAC operation shall be inhibited by the onboard PLC, or associated controller.
5) The BMS and fire control panel shall report an alarm to the Energy Management System (EMS).

4.3.1.4 An example configuration of the sub-systems used is shown overleaf in Figure 2.

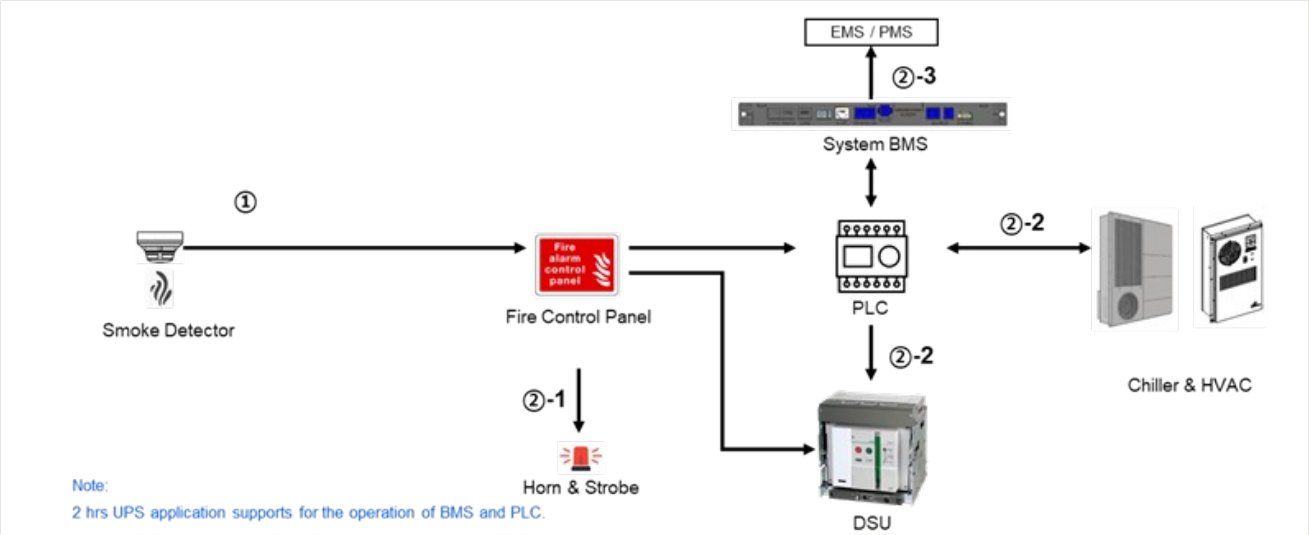

Figure 2: Battery Unit Fire Safety System Interfaces

4.3.1.5 The detection systems are linked to the batteries and electrical components management system (the fire control panel is placed within the LV control room). In case any of the detectors are triggered, a warning alarm shall sound, and a signal is to then be received by the security company. The 24/7 security company shall monitor the event through a site-wide CCTV to check if the warning is due to any external factor. The warning should then be reported to the SM who would follow the emergency procedure.

4.3.1.6 A fireman panel shall be installed near to the site access gate, so that the entire site may be shut down in case of an emergency. In addition, there are emergency stop buttons at various locations around the site.

4.3.1.7 The site's remote operations shall allow other site functions to be shut down immediately upon notification of an alarm.

4.4 Fire Reaction Systems (Suppression and Firefighting Equipment)

4.4.1 Deflagration Panels

4.4.1.1 Deflagration panels are safety devices designed to release a build up of pressure. They provide a controlled venting mechanism to prevent structural damage and minimise the risk of further fire or explosion within the battery container.

4.4.2 Active Venting System

4.4.2.1 The active venting system is activated by gas detection and is used to prevent the accumulation of hazardous gases. It functions as follows:

- **Venting Activation:** The system opens an electric shutter and engages the exhaust fans to expel hazardous gases. The shutter allows fresh air to enter, while the exhaust fan clears gas from the container.

- **Fan Control:** The exhaust fan runs until the gas concentration returns to a safe level (below LFL). Once gas concentrations are safe, both the fan and shutters return to normal operation.

4.4.2.2 The system prevents gasses from reaching the lower flammability limit and thus minimises the risk of an explosion.

4.4.3 Fire Extinguishing System

4.4.3.1 The fire extinguishing system consists of two main types of protection – coolant injection and dry pipe systems. These are elaborated upon below:

- **Direct Coolant Injection System:** When a fire is detected, the direct coolant injection system automatically releases coolant into the affected battery module. The coolant quickly suppresses the fire by cooling the battery module and interrupting the combustion process.

- **Dry Pipe System:** Serving as a last line of defence, the dry pipe system may be utilised by the fire department to direct water onto the battery modules, helping to control the spread of fire. It is typically used after other measures have been exhausted, adding an extra layer of protection.

4.4.3.2 Fire fighting water, to be used for dry pipe utilisation or any other strategy to be implemented by the fire department, shall be provided on site as elaborated upon in §5.3.

4.5 Battery Unit Spacing and Location

4.5.1.1 Battery containers shall be grouped into pairs. Each pair shall have no less than 3m clearance from all other equipment, including other battery container pairs.

4.5.1.2 NFCC Grid Scale BESS Planning Guidance [R1] states that:

"A standard minimum spacing between units of 6 metres is suggested unless suitable design features can be introduced to reduce that spacing. ***If reducing distances, a clear, evidence based, case for the reduction should be shown****."*

4.5.1.3 This approach shall therefore require the delivery of formal testing validation from the battery unit supplier. Such testing will need to unambiguously determine that pairs of battery containers which have ignited will not propagate to other equipment situated just outside of the 3m boundary.

4.5.1.4 Battery containers will not be stacked on top of one another in accordance with NFCC Grid Scale BESS Planning Guidance [R1].

4.5.1.5 The battery containers utilised on site have been situated away from Middleton Woods in order to minimise the risk of fire propagation from the site. This approach shall need to be retained, or otherwise justified, as the layout develops during detailed design.

5 Fire Emergency Response

5.1.1.1 The following sub-sections detail the potential emergency events and subsequent procedures to be followed in the event of a fire.

5.2 Emergency Procedures

5.2.1 Construction Phase

5.2.1.1 The ERP shall be shared with all the new personnel, contractors, and visitors before any activity on site starts.

5.2.1.2 If the ERP is revised, personnel must be re-inducted and any changes must be highlighted.

5.2.1.3 The fire-fighting strategy is the responsibility of the fire brigade; they shall be responsible for assessing the fire and subsequently determining the appropriate procedures relating to personnel, properties and the environment.

5.2.2 Operational Phase

5.2.2.1 During the operational phase, the site shall require minimal on-site occupation, with the exception of specific maintenance personnel. The ERP will be communicated to all visitors / contractors during their induction, which shall take place prior to site access.

5.2.2.2 The ERP shall be shared with the local authorities, fire brigade, and police in order to anticipate actions in event of a fire. The plan shall also be made available for consultation on site during construction, and be situated in H&S File folders throughout the operational phase.

5.3 Water Supply & Extinguishers

5.3.1.1 The water supply shall be designed to provide a minimum of 1,900 litres per minute for at least 2 hours as per the recommendations of NFCC Grid Scale BESS Planning Guidance [R1].

5.3.1.2 The fire fighting water supply is accommodated for by static water tanks placed around the site. These can each provide 228,000 litres of water (as per the above requirement), and have been placed at least 10m away from any and all battery containers as per the recommendations of NFCC Grid Scale BESS Planning Guidance [R1]. In addition, all battery containers have been placed within 100m of the nearest static water tank.

5.3.1.3 Static water tanks are not actively pressurised, and thus, the fire department will be required to use fire-fighting vehicle mounted pumps to provide pressure.

5.3.1.4 Fire-fighting equipment (CO2 suitable for electric fires and foam ext. for solid materials, other than electric equipment or components) shall be in place across the site in order to extinguish non-battery initiated fires.

5.3.1.5 An indicative location of fire extinguisher and static water tank placements can be found in Figure 3 below.

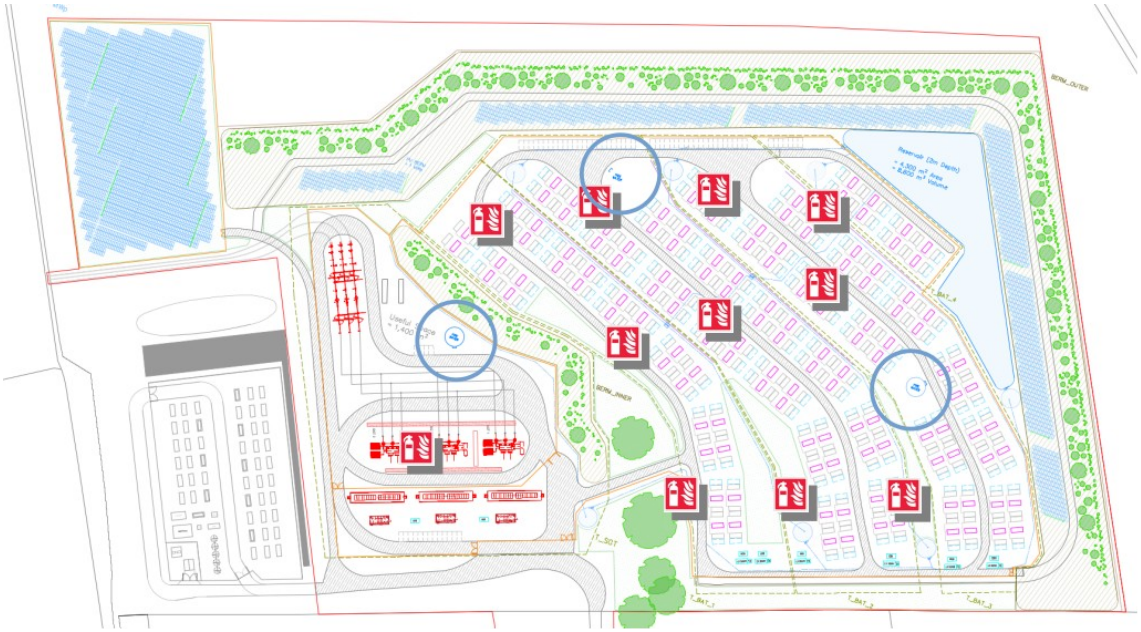

Figure 3: Fire Extinguisher and Static Water Tank Location

5.4 Fireman Panel

5.4.1.1 A fireman panel will be installed next to the site entrance, where the assembly point will be located. The fireman panels contain essential information for an emergency event, including:

- Emergency contact numbers,
- Site address,
- Site layout,
- Fire alarm repeater,
- Contact numbers for stakeholders.

5.4.1.2 A global emergency stop button is fitted to the fireman panel, which shuts down the entire site in the case of an emergency.

5.4.1.3 These emergency buttons will always be accessible and shall never be locked, nor may access to the panel be obstructed.

5.4.1.4 A 'Gerda Box', which serves as a secure enclosure for key site specific information for fire response teams, shall be installed beside the fireman panel.

5.5 Emergency Access and Exit

5.5.1.1 The site will utilise multiple emergency exit points at different locations around the site. This is to ensure that any persons on-site are not trapped within the site in the case of an exit path being obstructed.

5.5.1.2 This approach shall also benefit the emergency services who may require multiple entry points being made available for the site.

5.5.1.3 The functionality of all emergency exit and access points must be maintained and free of any obstacle or obstruction. The responsibility for this will be that of either the site manager or operations manager depending on the project phase.

5.6 Fire Event Scenario

5.6.1 Action Flow Chart

5.6.1.1 During a construction phase emergency, the following actions shall take place.

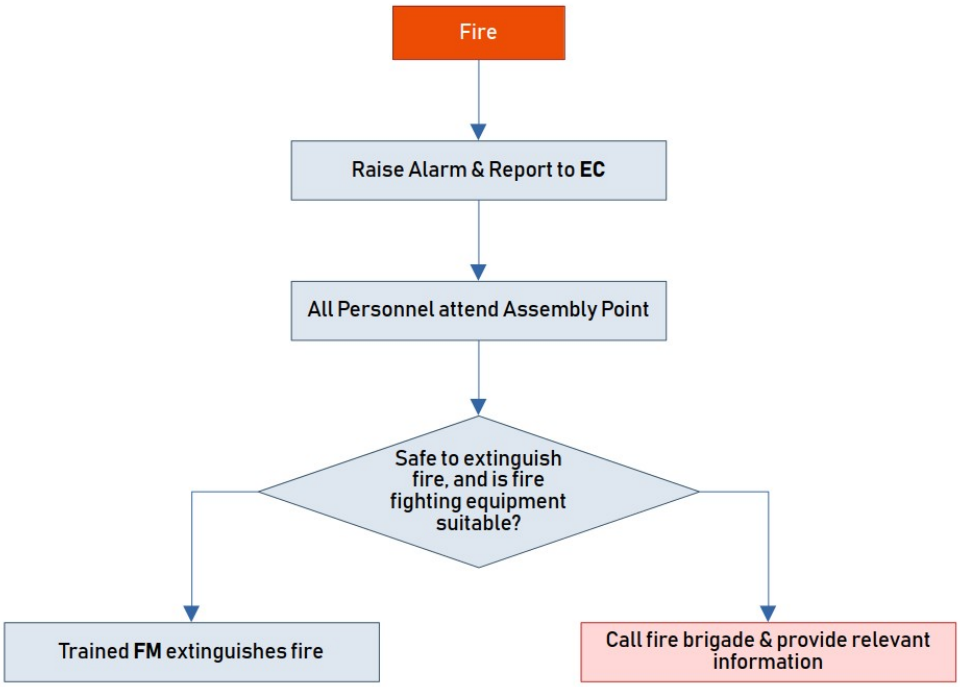

Figure 4: Construction Phase Emergency Action Flowchart

5.6.1.2 During an operational phase emergency, the following actions shall take place.

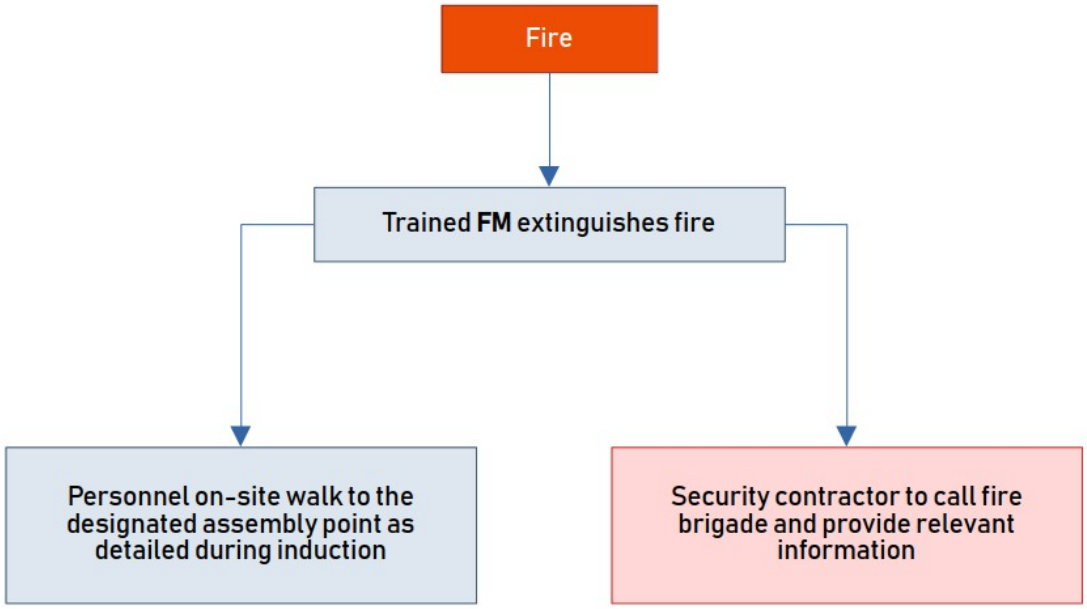

Figure 5: Operational Phase Emergency Action Flowchart

5.6.2 Detailed Action Breakdown

5.6.2.1 The following actions shall be undertaken in the event of a fire emergency:

1) Any person who encounters a situation which is deemed as a fire emergency, or an explosion, must notify the site EC immediately.

2) The EC will raise an alarm and notify all employees to evacuate. Due to the size of the site, the alarm will be raised using air horns. On hearing the alarm for evacuation, all operatives shall immediately leave their work and assemble at the designated area.

3) The EC will be responsible for undertaking the roll call and notifying the emergency services of any persons not accounted for, and any locations which cannot be adequately evacuated.

4) In the event of any injuries, and if it is safe to do so, First Aiders will administer first aid to any injured persons. During the project phases where there are two supervisors, there shall be an EC and a Deputy EC assigned. In the case of any injured persons, the Deputy EC will undertake the roll call whilst the EC/first aider carries out first aid to the injured party.

5) In the event of a minor fire, and once proper causation is identified, fire-fighting equipment shall be used to extinguish the fire. Only personnel qualified to operate fire-fighting equipment shall do so, and only in cases where there is no risk for any person. The fire extinguisher will be managed by the EC or the Deputy EC, who shall both be trained in the use of the fire extinguishers.

6) In the case of an uncontrolled fire, the fire brigade shall be called by the EC (or the deputy EC in case that the EC is carrying out first aid). All controls and required fire-fighting equipment identified in the FAR will be utilised.

7) In an event where emergency services are required, the EC will receive the emergency services at the site entrance (or the Deputy EC if it is required by the EC). The appointed person will guide emergency services to the casualty or, in the case of a fire or any event requiring the presence of the firemen, the location where services are required. The appointed person must speak fluent English and have an essential knowledge of the site's characteristics. Once emergency services are requested, any plant or vehicle on site must stop all manoeuvres and activities, avoiding any transit along the site tracks.

5.6.2.2 A selection of emergency contacts (in addition to usual 999 services) will be provided as the project progresses.

6 Recording

6.1.1.1 Any and all accidents shall be recorded by the EC within the site accident book.

6.1.1.2 Any near miss, dangerous occurrence, incident (including environmental incidents) will be recorded. An investigation shall also be carried out to determine root causes, immediate preventive actions, and any remedial actions which may prevent further events.

6.1.1.3 In the case of a personal injury, a further investigation shall be developed which external personnel shall cooperate in. The investigation report shall be shared with the client and the authorities if requested.

7 FAR and Hazard Log Management

7.1 Hazard Management

7.1.1.1 The output of this Fire Assessment Report document has been captured and managed in Appendix A – Blackford Energy Park Fire Hazard Log.

7.1.1.2 The hazard management process outlined in this FAR considers the recommendations of IEC TS 62933 standard, with specific attention to parts 5-1 [R8], 5-2 [R9], and 5-3 [R10].

7.1.2 Hazard Identification

7.1.2.1 Hazards have been identified as part of a desktop analysis based on technical expertise; historical experience and events; equipment manufacturer data; and NFCC guidance [R1].

7.1.2.2 Any reasonably foreseeable hazards must be documented in the hazard log and may relate to ignition and propagation sources as outlined in §3.2 of this document.

7.1.2.3 Each hazard identified must be given a specific cause (the events leading up to a hazard arising) and a specific consequence (the potential effect on human life in the event of a hazard arising). A hazard may have multiple causes; in this case, these are assessed and mitigated for separately.

7.1.3 Explicit Risk Estimation (Risk Acceptance Matrix)

7.1.3.1 For each hazard identified, the *likelihood* (linked to causation) and the *severity* (linked to consequence) are quantified as values, ranging from 1 – 5.

7.1.3.2 The product of both likelihood and severity determines the overall risk and hazard tolerability, as defined below:

- **Acceptable [A]:** Risk requires no further mitigation.
- **Tolerable [T]:** Risk requires a control measure to reduce to acceptable level or other justification required.
- **Intolerable [I]:** Safety requirements (mitigatory measures) must be implemented.

7.1.3.3 The tolerability is assessed prior to and post implementation of safety requirements.

7.1.3.4 The risk acceptance matrix used in this FAR for defining tolerability is tabulated below.

Risk Acceptance Matrix			Severity (S)				
			1	2	3	4	5
			Insignificant	Minor	Moderate	Major	Catastrophic
			Inconsequential Injury	Minor Injury	Lost Time Injury	Major Injury	Fatality
Likelihood (L)	1	Rare	A	A	A	A	A
	2	Unlikely	A	A	A	T	T
	3	Moderate	A	A	T	T	I
	4	Likely	A	T	T	I	I
	5	Almost Certain	A	T	I	I	I

7.1.4 Identification of Risk Reduction Methods

7.1.4.1 Each identified hazard is assigned a set of requirements (i.e. mitigating actions and measures), which must all be validated in order to mitigate the risk.

7.1.5 Validation of Risk Reduction Methods

7.1.5.1 The expected evidence and/or activity to be performed in order to validate each requirement has also been documented.

7.1.5.2 Validation of requirements is not expected to be fully completed until final test and commission of the project. Therefore, the FAR at this stage predominantly details the expected evidences to be delivered by each appropriate party.

7.1.6 Hazard Log Structure

7.1.6.1 The structure of the hazard log is described as per the table below.

Column Header	Description
ID	Unique hazard identification number.
Phase and Responsible Party	Denotes the specific party responsible for managing and validating the hazard.
Hazard Description	Details the hazard defined at the system boundary.
Hazard Cause	Details the leading causes which give rise to the hazard occurrence.
Consequence(s)	Details the worst case scenario consequence of the hazard arising with regards to damage or harm caused (e.g. minor injury, fatality, etc.).
L / S / Risk (*Pre Safety Measure*)	Details the likelihood (L), severity (S), and Risk (calculated using the risk acceptance matrix) associated with the hazard prior to all safety measures being implemented.
Risk Reduction Methods	Lists the safety requirements (mitigatory measures) to be implemented and validated.

Column Header	Description
Expected Validation Evidence	Details the evidence expected in order to validate the safety requirement.
L / S / Risk (*Post Safety Measure*)	Details the likelihood (L), severity (S), and Risk (calculated using the risk acceptance matrix) associated with the hazard once all safety measures are implemented.

7.2 FAR Revision Process

7.2.1.1 This FAR document and the associated hazard log shall be continually updated as and when required. The FAR review process shall consider significant changes in people, plant, or processes; or when the organisation determines that the FAR is no longer valid, such as:

- Following a fire or arson attempt,
- Major alterations to the site,
- Significant operational changes,
- When requested to do so by fire officers or authorities.

7.2.1.2 During the construction phase, the EPC shall be responsible in keeping informed and applying findings and technology enhancements that improve the safety of the BESS development. As legislation is subject to changes, the EPC is also responsible in keeping informed and amending the FAR to reflect new requirements.

7.2.1.3 Once construction is complete, the operator will be responsible for following any new requirements and/or regulation which may improve the safety of the BESS site.

8 Appendix A – Blackford Energy Park Fire Hazard Log

Hazard Information						Pre-Safety Measure ERE					Post-Safety Measure ERE			
ID	**Phase & Responsible Party**	**Hazard Description**	**Sub_ID**	**Hazard Cause**	**Consequence(s)**	**L**	**S**	**Risk**	**Risk Reduction Methods**	**Expected Validation Evidence**	**L**	**S**	**Risk**
BEPF_001	Construction (EPC) and Operation (Operator)	Battery Container Unit ignites via internal source.	001.1	Thermal runaway initiated by a short circuit event via formation of battery dendrites.	Fire spreads across site, potential for major injury and/or fatality.	3	5	Intolerable	The Battery Unit shall comply with EU safety standards, including IEC 62619 / 62477-1 LVD / 61000-6-2/-4 EMC, and UL 1973. The BMS shall actively aim to prevent overcharging. Should the BMS or smoke/gas detectors trigger, a signal shall be sent to the fire control panel which shall activate the horn and strobe alarm (or other alarm system). Battery operation shall forcefully cease and the EMS shall also be alerted. Direct cooling injection (to prevent propagation) shall be automatically activated to reduce the risk of propagation / thermal output. Maintenance of battery sub-systems (including emergency devices) shall be undertaken according to manufacturer requirements by trained competent personnel, once the site is in operation. In the event of absolute emergency, the fire department shall have access to battery dry-rise sprinkler systems, which may be used to directly apply water to the battery modules.	Battery supplier shall provide standard certification, test certification, and product specification (including fire detection and monitoring logic). The on-site testing schedule must include a selection of tests which ensure that the interfaces between the battery containers and the secondary/primary fire alarm panels for the site function as anticipated. The EPC shall produce an operations and maintenance schedule for the operator to follow. The operator shall be responsible for ensuring that staff undertake periodic maintenance, and that those staff are suitably competent.	1	4	Acceptable
			001.2	Thermal runaway initiated by a short circuit event via external source (faulty wiring, mechanical damage, etc.).		3	5	Intolerable			1	4	Acceptable
			001.3	Over-voltage or overcharge, leading to venting of explosive gasses.		3	5	Intolerable			1	4	Acceptable
			001.4	Sustained electrical arc fault leading to ignition of cable or surrounding material.		3	5	Intolerable			1	4	Acceptable
			001.5	Excessively high discharge demand on the battery system.		2	5	Tolerable			1	4	Acceptable
			001.6	Inadequate management of operating environment		2	5	Tolerable	Battery containers shall utilise HVAC for moisture control and chiller units for battery cell temperature control under normal operation.	Battery supplier O&M documentation must specify the rating of both the HVAC and chiller units used.	1	4	Acceptable
			001.7	Cascading failure from adjacent battery cells within rack.		3	5	Intolerable	Direct cooling agent injection systems shall be utilised in the event of overheating in order to prevent thermal propagation.	Battery supplier O&M documentation must specify the direct cooling agent injection system. The manufacturer shall provide factory acceptance test certificates to validate system functionality.	1	4	Acceptable

Hazard Information						Pre-Safety Measure ERE					Post-Safety Measure ERE		
ID	Phase & Responsible Party	Hazard Description	Sub_ID	Hazard Cause	Consequence(s)	L	S	Risk	Risk Reduction Methods	Expected Validation Evidence	L	S	Risk
BEPF_002	Construction (EPC) and Operation (Operator)	Battery Container Unit ignites via external source.	002.1	Exposure to external flame or surrounding fire due to other site equipment failure.	Fire spreads across site, potential for major injury and/or fatality.	3	5	Intolerable	Battery container pairs shall be placed at least 3m away from all other equipment in order to prevent fire from spreading. Fire-fighting equipment (CO2 suitable for electric fires and foam ext. for solid materials other than electric equipment or components) shall be in place across the site in order to extinguish non-battery initiated fires. Fire sensors shall be connected to a fire panel warning via SCADA. Maintenance of site equipment (including emergency devices) shall be undertaken according to manufacturer requirements by trained competent personnel, once the site is in operation	Battery supplier must provide appropriate test documentation to justify that 3m of separation is adequate in preventing fire propagation.	1	4	Acceptable
			002.2	Trespasser enters site and commits arson.		2	5	Tolerable	The site shall utilise security and access control measures, including the use of security fencing, locked gates, and 24/7 CCTV surveillance.	EPC site specification is to include fencing and CCTV coverage data. EPC will be required to produce a security plan for the construction works to minimise the effect of trespass. Operator will be required to manage the security of the site during operations.	1	4	Acceptable
			002.3	Lightning strike.		1	5	Acceptable	N/A - Rare scenario somewhat reduced in severity through usual surge protections and other safety requirements (including emergency egress) noted in this document.	N/A - Rare scenario somewhat reduced in severity through usual surge protections and other safety requirements (including emergency egress) noted in this document.	1	4	Acceptable

Hazard Information						Pre-Safety Measure ERE					Post-Safety Measure ERE		
ID	Phase & Responsible Party	Hazard Description	Sub_ID	Hazard Cause	Consequence(s)	L	S	Risk	Risk Reduction Methods	Expected Validation Evidence	L	S	Risk
			002.4	Human error or unexpected behaviour (smoking, personal ignition sources brought to site, etc.).		3	4	Tolerable	A PAT (Permit-to-Access) shall be required in order to enter the site. Specific site inductions shall be undertaken for all visitors to highlight the site rules and requirements (smoking/vaping prohibition, etc.). Disciplinary action shall be undertaken for unsafe behaviours. 'Hot' works are to be managed under a permit-to-work system. An Emergency Response Plan (ERP) shall be available on site. This will include location of emergency firefighting devices and assembly points.	EPC production of induction material and ERP.	2	3	Acceptable
			002.5	Fire in neighbouring area outside of the project boundary (main sources are Middleton Woods and the Rothienorman Substation).		2	4	Tolerable	The site layout shall incorporate multiple access points which are suitable for fire service vehicles. EPC shall produce a fire evacuation and emergency plan in collaboration with the local fire department for the site under construction, and all emergency coordinators shall be suitably competent. The operator will be required to ensure all staff are aware of site emergency procedures, and all emergency coordinators shall be suitably competent. The functionality of all emergency access points must be maintained and free of any obstacle or obstruction. Batteries shall be situated furthest away from both Middleton Woods and Rothienorman Substation	EPC site layout shall evidence use of multiple fire access points and position of battery containers. Fire evacuation and emergency plan to be formally issued.	1	4	Acceptable
BEPF_003	Construction (EPC) and Operation (Operator)	Electrical Equipment (other than battery container) ignites.	003.1	Equipment malfunction or failure.	Fire causes major injury and/or fatality.	2	5	Tolerable	Maintenance of site equipment (including emergency devices) shall be undertaken according to manufacturer requirements by trained competent personnel, once the site is in operation. Fire-fighting equipment (CO2 suitable for electric fires and foam ext. for solid materials other than electric equipment or components) shall be in place across the site in order to extinguish non-battery initiated fires.	The EPC shall produce an operations and maintenance schedule for the operator to follow. The operator shall be responsible for ensuring that staff undertake periodic maintenance, and that those staff are suitably competent.	1	4	Acceptable

Hazard Information						Pre-Safety Measure ERE					Post-Safety Measure ERE		
ID	Phase & Responsible Party	Hazard Description	Sub_ID	Hazard Cause	Consequence(s)	L	S	Risk	Risk Reduction Methods	Expected Validation Evidence	L	S	Risk
			003.2	Lightning strike.		1	5	Acceptable	N/A - Rare scenario somewhat reduced in severity through usual surge protections and other safety requirements (including emergency egress) noted in this document.	N/A - Rare scenario somewhat reduced in severity through usual surge protections and other safety requirements (including emergency egress) noted in this document.	1	4	Acceptable
			003.3	Trespasser enters site and commits arson.		2	4	Tolerable	The site shall utilise security and access control measures, including the use of security fencing, locked gates, and 24/7 CCTV surveillance.	EPC site specification is to include fencing and CCTV coverage data. EPC will be required to produce a security plan for the construction works to minimise the effect of trespass. Operator will be required to manage the security of the site during operations.	1	4	Acceptable
			003.4	Human error or unexpected behaviour (smoking, personal ignition sources brought to site, etc.).		3	4	Tolerable	A PAT (Permit-to-Access) shall be required in order to enter the site. Specific site inductions shall be undertaken for all visitors to highlight the site rules and requirements (smoking/vaping prohibition, etc.). Disciplinary action shall be undertaken for unsafe behaviours. 'Hot' works are to be managed under a permit-to-work system. An Emergency Response Plan (ERP) shall be available on site. This will include location of emergency firefighting devices and assembly points.	EPC production of induction material and ERP.	2	3	Acceptable

Hazard Information						Pre-Safety Measure ERE					Post-Safety Measure ERE		
ID	**Phase & Responsible Party**	**Hazard Description**	**Sub_ID**	**Hazard Cause**	**Consequence(s)**	**L**	**S**	**Risk**	**Risk Reduction Methods**	**Expected Validation Evidence**	**L**	**S**	**Risk**
BEPF_004	Construction (EPC), Operation and Maintenance Activities (Operator)	Flammable material (diesel, paint, or transformer oil) ignites on-site.	004.1	Auxiliary diesel generator fuel exposed to naked flame during maintenance.	Fire causes major injury and/or fatality.	3	5	Intolerable	Flammable materials shall require a COSHH assessment and a Safety Data Sheet (MSDS), detailing how to treat, use, manage, store, and dispose of each flammable substance. Flammable material must be stored according to COSHH assessment.	COSHH assessment document and signage. EPC production of induction material and ERP.	1	4	Acceptable
			004.2	Flammable material used for maintenance (e.g. transformer oil, paint, etc.) exposed to naked flame during maintenance.		3	5	Intolerable	Smoking or ignition sources to be avoided near to the flammable substances. 'Hot' works – usually required for some corrective maintenance – shall require additional control measures and a permit-to-work.		1	4	Acceptable
			004.3	Trespasser enters site and commits arson.		2	5	Tolerable	The site shall utilise security and access control measures, including the use of security fencing, locked gates, and 24/7 CCTV surveillance.	EPC site specification is to include fencing and CCTV coverage data. EPC will be required to produce a security plan for the construction works to minimise the effect of trespass. Operator will be required to manage the security of the site during operations.	1	4	Acceptable
			004.4	Human error or unexpected behaviour (smoking, personal ignition sources brought to site, etc.), accidentally ignites flammable material unknowingly.		3	5	Intolerable	A PAT (Permit-to-Access) shall be required in order to enter the site. Specific site inductions shall be undertaken for all visitors to highlight the site rules and requirements (smoking/vaping prohibition, etc.). Disciplinary action shall be undertaken for unsafe behaviours. 'Hot' works are to be managed under a permit-to-work system. An Emergency Response Plan (ERP) shall be available on site. This will include location of emergency firefighting devices and assembly points.	EPC production of induction material and ERP.	2	3	Acceptable
BEPF_005	Construction (EPC) and Operation (Operator)	Monitoring/Control room propagates fire.	005.1	Electric devices within building malfunction.	Fire causes major injury and/or fatality.	2	4	Tolerable	PAT testing shall be required for electric portable appliances (cellular chargers, printers, laptop chargers, etc.).	PAT test certificates to be maintained by both EPC and operator (project phase dependent).	2	3	Acceptable

Hazard Information						Pre-Safety Measure ERE					Post-Safety Measure ERE		
ID	Phase & Responsible Party	Hazard Description	Sub_ID	Hazard Cause	Consequence(s)	L	S	Risk	Risk Reduction Methods	Expected Validation Evidence	L	S	Risk
			005.2	Control and/or monitoring equipment malfunction.		2	5	Tolerable	Maintenance of site equipment (including emergency devices) shall be undertaken according to manufacturer requirements by trained competent personnel, once the site is in operation. Procedures shall include suitable controls and verification of the installation, testing and inspection, prior to commissioning and after any test or inspection. EPC HV Safety Rules shall be applicable in any and all HV environments. Smoke detectors shall be fitted (and connected to the fire panel) according to the UK standard BS 5839- 1:2017 and wiring to the standard 7671:2018. Detection shall be inspected and tested by an external competent person (standard BS 5839). Fire-fighting equipment (CO2 suitable for electric fires and foam ext. for solid materials other than electric equipment or components) shall be in place across the site in order to extinguish non-battery initiated fires.	The EPC shall produce an operations and maintenance schedule for the operator to follow. The operator shall be responsible for ensuring that staff undertake periodic maintenance, and that those staff are suitably competent. Smoke detection certification to be formally issued.	1	4	Acceptable
			005.3	Trespasser enters site and commits arson.		2	4	Tolerable	The site shall utilise security and access control measures, including the use of security fencing, locked gates, and 24/7 CCTV surveillance. Only authorised personnel shall be allowed to enter monitoring/control cabins.	EPC site specification is to include fencing and CCTV coverage data. EPC will be required to produce a security plan for the construction works to minimise the effect of trespass. Operator will be required to manage the security of the site during operations.	1	4	Acceptable

Hazard Information						Pre-Safety Measure ERE					Post-Safety Measure ERE		
ID	Phase & Responsible Party	Hazard Description	Sub_ID	Hazard Cause	Consequence(s)	L	S	Risk	Risk Reduction Methods	Expected Validation Evidence	L	S	Risk
			005.4	Human error or unexpected behaviour (smoking, personal ignition sources brought to site, etc.).		3	4	Tolerable	A PAT (Permit-to-Access) shall be required in order to enter the site. Specific site inductions shall be undertaken for all visitors to highlight the site rules and requirements (smoking/vaping prohibition, etc.). Disciplinary action shall be undertaken for unsafe behaviours. 'Hot' works are to be managed under a permit-to-work system. An Emergency Response Plan (ERP) shall be available on site. This will include location of emergency firefighting devices and assembly points.	EPC production of induction material and ERP.	2	3	Acceptable
BEPF_006	Construction (EPC) and Operation (Operator)	Generator ignites.	006.1	Generator overheats when providing auxiliary supply.	Fire causes major injury and/or fatality.	2	5	Tolerable	Maintenance of site equipment (including generation equipment) shall be undertaken according to manufacturer requirements by trained competent personnel, once the site is in operation.	The EPC shall produce an operations and maintenance schedule for the operator to follow. The operator shall be responsible for ensuring that staff undertake periodic maintenance, and that those staff are suitably competent. Smoke detection certification to be formally issued.	1	4	Acceptable
BEPF_007	Construction (EPC) and Operation (Operator)	Emergency responses unable to respond in time to early ignition detection event.	007.1	Poor emergency procedure and/or obstructed site access.	Fire is allowed to uncontrollably propagate, leading to major injury and/or fatality.	3	5	Intolerable	The site layout shall incorporate multiple access points which are suitable for fire service vehicles. EPC shall produce a fire evacuation and emergency plan in collaboration with the local fire department for the site under construction, and all emergency coordinators shall be suitably competent. The operator will be required to ensure all staff are aware of site emergency procedures, and all emergency coordinators shall be suitably competent. The functionality of all emergency access points must be maintained and free of any obstacle or obstruction.	EPC site layout shall evidence use of multiple fire access points. Fire evacuation and emergency plan to be formally issued.	1	4	Acceptable

Hazard Information						*Pre-Safety Measure ERE*					*Post-Safety Measure ERE*		
ID	**Phase & Responsible Party**	**Hazard Description**	**Sub_ID**	**Hazard Cause**	**Consequence(s)**	**L**	**S**	**Risk**	**Risk Reduction Methods**	**Expected Validation Evidence**	**L**	**S**	**Risk**
BEPF_008	Construction (EPC) and Operation (Operator)	Position of fire does not allow on-site personnel to access emergency exit.	008.1	Inappropriate configuration of site emergency exits (too few exits, poor positioning, etc.).	Fire causes major injury and/or fatality.	3	5	Intolerable	The site layout shall incorporate multiple access points which are suitable for fire service vehicles. The site layout shall incorporate multiple emergency exit locations, positioned such that no personnel may be trapped on-site during the event of a single fire. EPC shall produce a fire evacuation and emergency plan in collaboration with the local fire department for the site under construction, and all emergency coordinators shall be suitably competent. The operator will be required to ensure all staff are aware of site emergency procedures, and all emergency coordinators shall be suitably competent. The functionality of all emergency access points must be maintained and free of any obstacle or obstruction.	EPC site layout shall evidence use of multiple fire access points. EPC site layout shall evidence use of multiple emergency exit points. Fire evacuation and emergency plan to be formally issued.	1	5	Acceptable
BEPF_009	Construction (EPC) and Operation (Operator)	Fire on-site propagates to Middleton Woods.	009.1	Inappropriate configuration of site allows for major sources of ignition to be close to Middleton Woods (located south of the proposed BESS development). Ignition event occurs (see hazards listed above) and fire subsequently propagates.	Fire spreads outside the project area, causing major injury, destruction of infrastructure, and/or fatality.	3	5	Intolerable	The site's configuration shall best aim to keep battery containers away from the location of Middleton Woods. Battery container pairs shall be placed at least 3m away from all other equipment in order to prevent fire from spreading.	EPC site layout shall evidence a considered approach to positioning of battery container units. Battery supplier must provide appropriate test documentation to justify that 3m of separation is adequate in preventing fire propagation.	1	5	Acceptable
BEPF_010	Construction (EPC) and Operation (Operator)	Arcflash event occurs at HV switchgear.	010.1	Physical switchgear breakage / faulty equipment leads to short circuit or ground electrical fault (e.g. insulation breakdown via moisture ingress).	Explosion, switchgear ignites. Fire from switchgear spreads across site causing major injury/fatality.	3	5	Intolerable	All switchgear shall be designed in accordance with IEC 62271-1 and IEC 62271-200. Preventative/planned maintenance of site equipment (including switchgear equipment) shall be undertaken according to manufacturer requirements by trained competent personnel, once the site is in operation.	Switchgear manufacturer documentation shall demonstrate compliance with IEC 62271-1 and IEC 62271-200. Documentation will also detail any additional design protections such as pressure relief, IP protection, fault testing, and enclosure specification. The EPC shall produce an operations and maintenance schedule for the operator to follow. The operator shall be responsible for ensuring that staff undertake periodic maintenance, and that those staff are suitably competent.	1	4	Acceptable

Hazard Information						Pre-Safety Measure ERE					Post-Safety Measure ERE		
ID	Phase & Responsible Party	Hazard Description	Sub_ID	Hazard Cause	Consequence(s)	L	S	Risk	Risk Reduction Methods	Expected Validation Evidence	L	S	Risk
			010.2	Improper maintenance procedure leads to short circuit or ground electrical fault (e.g. uninsulated tools dropped on live component).	Explosion, switchgear ignites. Fire from switchgear spreads across site causing major injury/fatality.	3	5	Intolerable	The operator shall ensure that operation and work activities performed on switchgear are compliant with EN 50110. All persons working on switchgear shall be specifically authorised/competent to do so. Restriction of access to switchgear shall be maintained by the operator. A dynamic risk assessment should also be performed before undertaking any work on switchgear equipment. Maintenance activities shall be not be performed on live switchgear.	The EPC shall produce an operations and maintenance schedule for the operator to follow. In addition, the risks of arc-flash and appropriate maintenance procedures must be made clear to those responsible for undertaking switchgear maintenance. The operator shall be responsible for ensuring that staff undertake periodic maintenance, and that those staff are suitably competent.	1	4	Acceptable