



KIRKBY BESS FIRE STATEMENT

on behalf of:
Pelagic Energy
April 2024
J21089 – Revision 3



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Revision Record

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Executive Summary

This report has been prepared on behalf of Pelagic Energy to support their planning application and non-material amendments for the Kirkby Battery Energy Storage System (BESS) site.

The site BESS units fully comply with international safety standards such as UL 9540A, UL 1973, IEC 62 933, and NFPA 855, according to the manufacturer and meet business continuity and property protection requirements.

The design and layout of the BESS within the site comply with the guidance given in NFPA 855 Standard for the Installation of Stationary Energy Storage Systems (2023). Compliance with this standard is deemed to meet the National Fire Chiefs Council (NFCC) Guide: Grid-Scale Battery Energy Storage System Planning (2023).

Key points are:

- Spacing of the BESS units will be in accordance with NFPA 855 and NFCC Guide: Grid-Scale Battery Energy Storage System Planning (2023).
- A fire hydrant will be provided to the site, spurred off the existing main located on Coopers Lane. Access to all parts of the site is possible within 90 m of the hydrant.
- A hammerhead is included in the roads on site to provide suitable Fire and Rescue Service vehicle access.
- In addition to the above, and to enhance fire safety measures on site the BESS Units will have fitted as standard:
 - Deflagration prevention / venting systems design and specifications;
 - Fire detection and suppression system;
 - Fire compartmentation;
 - Visual and Audible alarm systems;
 - Battery Management System.

The client will also provide for the Fire and Rescue Authority (FRA):

- Site Specific Risk Information Report (SSRI);
- Emergency Response Plan for First Responders (ERP);
- Battery Storage Safety (Operational) Management Plan;
- Fire Risk Management Plan (RMP).

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Referenced Documents

Below is a list of codes and standards which were used as reference for the site fire statement and site planning process.

Grid Scale Battery Energy Storage System planning – Guidance for FRS	
Dangerous Substances and Explosive Atmosphere Regulations (DSEAR) 2002	
FM Global Property Loss Prevention Data Sheet 5-33: Electrical Energy Storage Systems	
Approved Document B, Fire Safety – Volume 2 Buildings other than Dwellings (2019 edition incorporating 2020 and 2022 amendments) (ADB)	
United Kingdom Power Networks (UKPN) Engineering Design Standard 07-0116: Fire Energy Storage Systems, 2016	
Energy-Institute-Battery-Storage-Guidance_Note-2-Fire-Planning-and-Response	
Civil Contingencies Act 2004	
Environmental Damage (Prevention and Remediation) Regulations 2009.	
NFPA 855	The National Fire Protection Association (Standard for the Installation of Energy Storage Systems)
UL 9540:	Energy Storage System (ESS) Requirements
NFPA 69 -	Standard on Explosion Prevention Systems
BS 5839 Part 1 2017:	Fire Detection and Fire Alarm Systems for Buildings
BS 5499	British Standard for Signage (Including Fire Safety Signage)
BS 9251	British Standard for Fire Sprinklers
BS 9999:	Code of practice for fire safety in the design, management and use of buildings
Table 1: Codes and Standards	

1 Introduction

The Pelagic Energy BESS site in Kirkby, Liverpool, is adjacent to the Kirkby Substation in the northeast corner of the site as shown in Figure 1 below.

The site consists of a Switchgear Building, Control Room, Auxiliary Transformer Compound, BESS and PCS MV Stations.

This report details the fire safety strategy for the proposed layout for the Kirkby BESS Site, including guidance on fire and rescue service access, separation distances and firefighting water capabilities. The guidance addresses the critical issues raised in the NFCC guidance on Grid-Scale Battery Energy Storage System Planning (2023).

The battery energy storage unit manufacturer has now been confirmed as Envision and the battery type (AESC315AhLFP Prismatic Cells),

As the site has restricted access, any requirements for access and egress will be developed in consultation with the Fire and Rescue Service (F&RS) and documented as part of the site Emergency Response plan (ERP).

To ensure the highest fire safety standard the BESS units will have been tested to UL9540A. The test method for evaluating thermal runaway and fire propagation in Battery Energy Storage Systems. In addition, the BESS units will have integrated fire, heat and smoke detection, alarm, and suppression systems. The systems are subject to BESS manufacturer design/specification and Pelagic Energy engineers' approval.

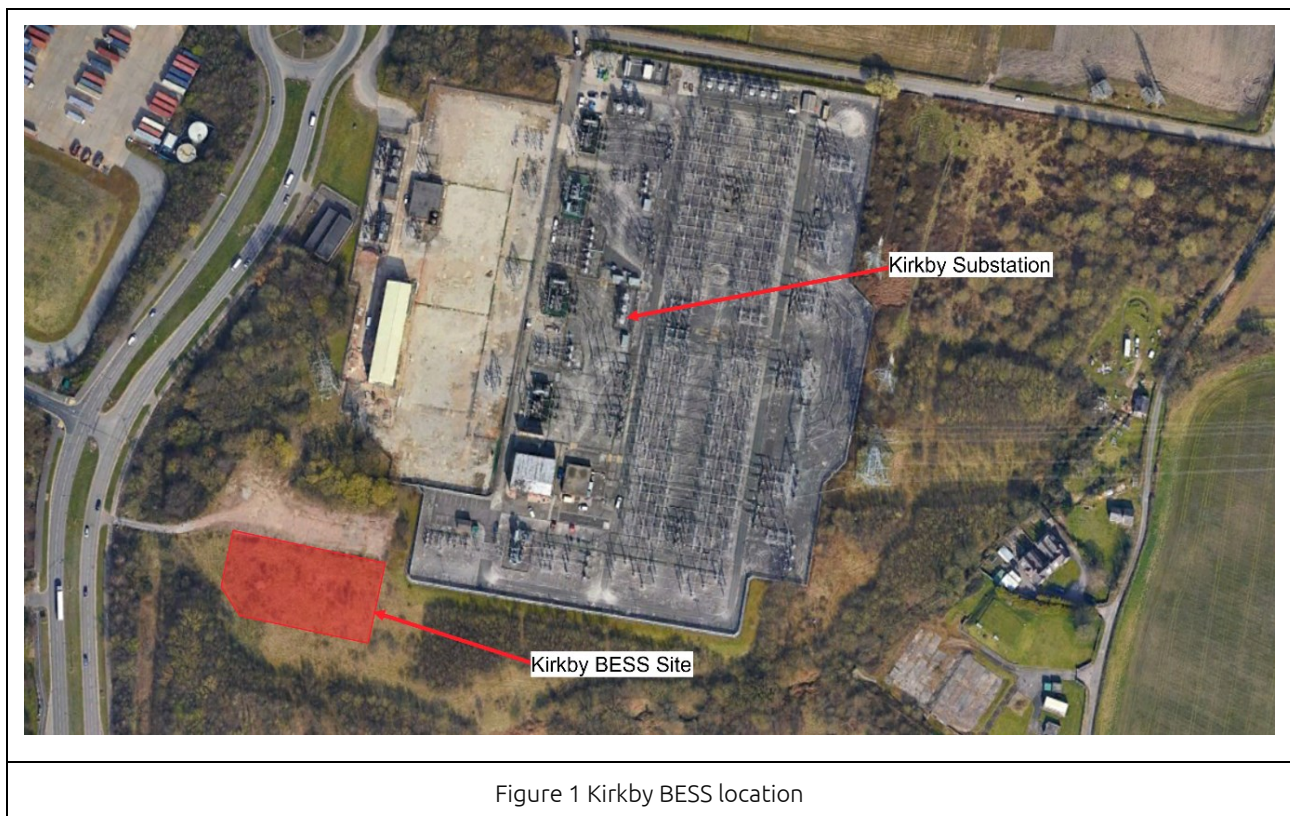


Figure 1 Kirkby BESS location

2 Site Location

The site has been selected with a close proximity to Kirkby National Grid Substation. The land around the facility comprises of scrubland owned by National Grid. Access to the site is via an existing National Grid access road, off Coopers Lane, which will be shared access.

3 Applicable Standards

All BESS units installed on site at Kirkby will meet the requirements of the UL9540A fire test. This globally recognised testing standard for fire safety in BESS address the following key issues:

- BESS installation requirements.
- Ventilation requirements for explosion and deflagration prevention.
- Effectiveness of BESS fire protection (integral and / or external).
- Impact of the BESS design on fire service strategy and tactics.

The adoption of the test standard also influences the battery management system, which is a key part of prevention of fires by allowing early detection of a potential incident before it occurs and taking remedial measures before a fire can occur.

Battery manufacturers have also undertaken additional 'ad-hoc' tests assessing the impact of factors such as full thermal runaway, external fires etc. Where applicable the results of these tests will be included within the Fire Safety Study to be produced as part of the design package.

4 Fire and Rescue Service Facilities

4.1 Fire Appliance and Vehicle Access

The main access road to and from the site is designed in accordance with guidance of Approved Document B (ADB). Although ADB is not applicable as this site is exempt under the Building Regulations as it is classified as a building with infrequent occupants, it provides useful access road specifications which are outlined in the table below. It should be noted that fire vehicles differ across the UK for different fire and rescue services and access route specifications, which should be confirmed by the local fire service.

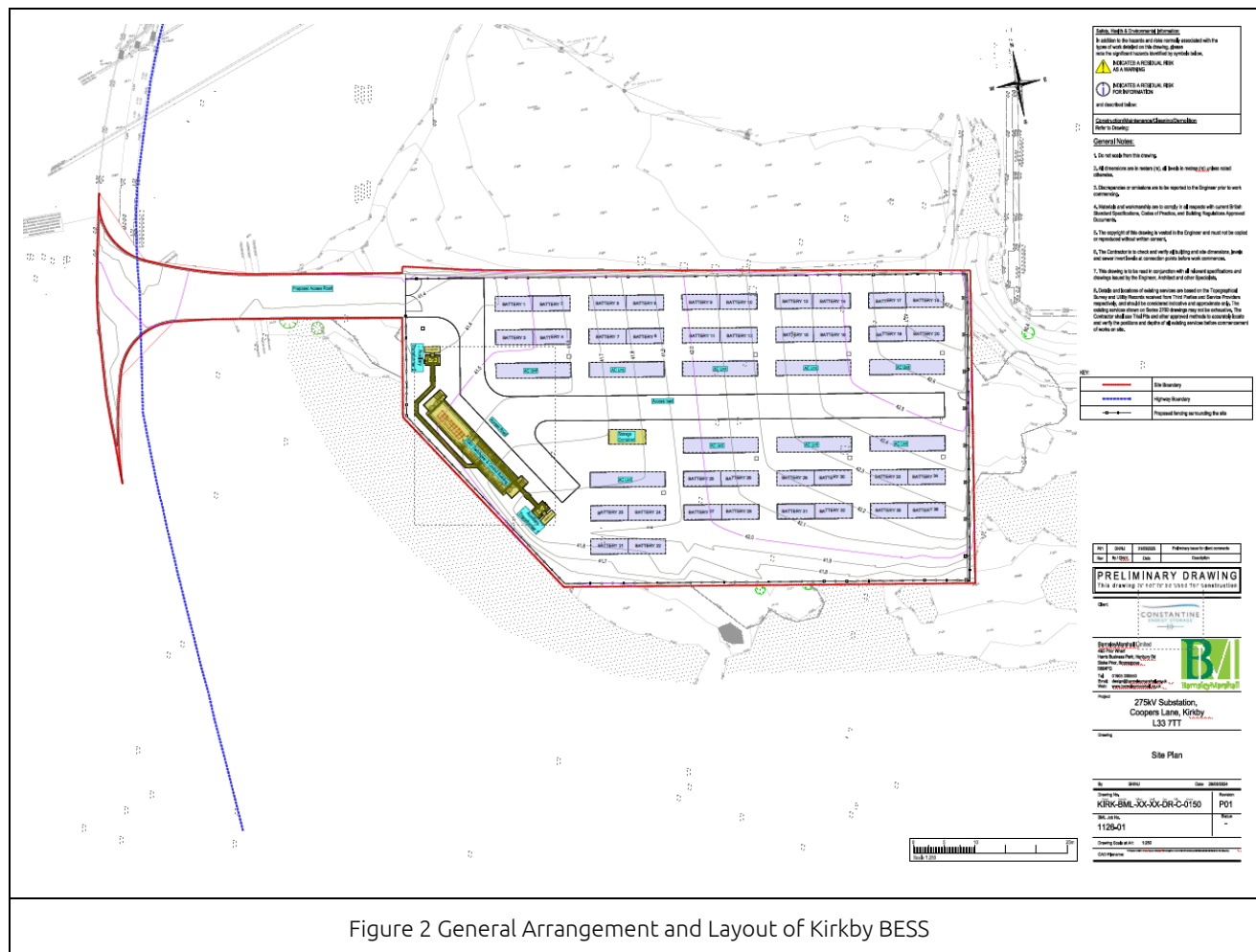
Appliance type	Minimum width of road between kerbs (m)	Minimum width of gateways (m)	Minimum turning circle between kerbs (m)	Minimum turning circle between walls (m)	Minimum clearance height (m)	Minimum carrying capacity (tonnes)
Pump	3.7	3.1	16.8	19.2	3.7	12.5
High reach	3.7	3.1	26.0	29.0	4.0	17.0

Table 2: Typical Fire and Rescue Service vehicle access route specification

Source: ADB, Volume 2 Buildings other than Dwellings; 2019 edition incorporating 2020 and 2022 amendments.

With the site being land locked by adjoining National Grid land, a second access route is not possible, as all access routes would need to be via the Coopers Lane entrance. Given the very small area of the BESS site of 4,451 m², the provision of two entrances is not considered necessary to allow effective firefighting operations. It is noted that no recommendations to provide a second entrance

are given in the guidance of NFPA 855 or BS 9999. The roads on site are to be tarmac or other hard wearing surfaces that will be capable of accommodating vehicles, including fire and rescue service vehicles, in all weather conditions. The internal roadway will include the provision of a hammerhead meeting the guidance given in BS 9999 for the use of fire and rescue vehicles.



4.2 Fire Hydrant and Water Supplies

It is proposed that the site will be connected to the water main, serving the statutory hydrant located on Coopers Lane, via a spur. (Figure2), subject to approval from the Water Authority. The existing flow rates are to be confirmed, as part of the Water Authority application process, but as the existing hydrant system also serves the adjoining Knowsley Industrial Park, it should be sufficient in flow rate and pressure for the BESS site and fall in line with the NFCC guidance on Grid-Scale Battery Energy Storage System Planning (2023).

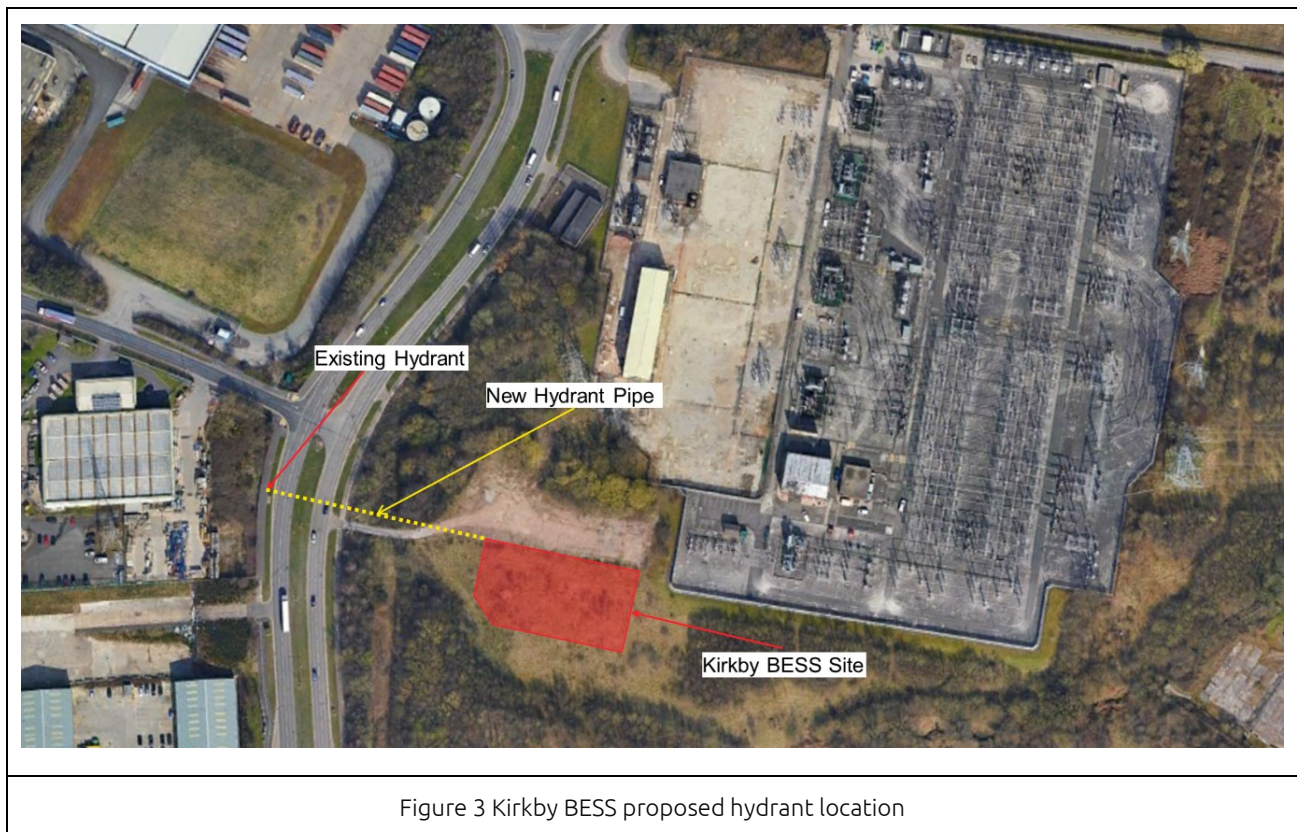


Figure 3 Kirkby BESS proposed hydrant location

The new site hydrant will be designed in accordance with BS 9990 Non automatic fire-fighting systems in buildings. Code of practice. The location of the hydrant will be in such a manner that all BESS and ancillary facilities will be within 90m of the hydrant.

In addition to the hydrant, it is also proposed to provide a circa 25m³ water storage tank, located underground and fed to a local hydrant located on the access road to the site, with a fire-fighting connection. This allows the fire and rescue service to utilise should the hydrant flow be inadequate for firefighting demands at any specific time. This is as recommended in the NFCC guidance document 2023 and NFPA 855.

Signage of hydrants and connections will be provided and detailed in the emergency response plan to allow rapid identification for FRS personnel.

4.3 Fire Water Run-off

The client, as the site operator, understands their legal obligations to ensure measures are in place to prevent contaminated fire water run-off from entering the watercourse under legislation such as Environmental Damage (Prevention and Remediation) Regulations 2009.

The transformer skids and ancillary equipment are fitted with sump collection as well as the site providing permeable paving and perforated drainage pipes taking any water collected on site to an oil separation and collected/discharged under local authority water discharge consent.

5 Separation and Clearance Distances

The property protection and business continuity requirements of the client require the prevention of fire spread to adjoining BESS cabinets, and in the event of a catastrophic level event (including external fire scenarios) of fire spread from a series of cabinets to any other adjoining cabinets. This is undertaken using suppression systems, fire resistance to the cabinets and separating the BESS by pathways and roads.

While guidance on spacings is provided by the manufacturer, based on their fire tests, as a minimum the fire spacings will also be required to meet the guidance given by the NFCC Grid-Scale Battery Energy Storage System Planning (2023) and NFPA 855, to meet insurance requirements. The required separation distances are detailed below:

5.1 BESS

BESS units are provided as a set of individual cabinets or as an ISO type shipping container. Whether the BESS unit is provided as a set of cabinets or a single container, is subject to the battery manufacturer. The term 'BESS unit' has been used where separation distances apply equally to either type.

5.1.1 Spacing Between Cabinets

Spacings between individual cabinets within a 'set' of cabinets will be as per the manufacturer's instructions. This is specific to individual manufacturers and the outcomes of the manufacturer specific fire tests.

5.1.2 BESS Units

'BESS units' are required to be provided with a minimum separation distance of 1m *. However, typically to allow the units to be safely maintained and operated, the actual distance is increased to a minimum of 2.2 m. In this case, a provisional separation distance of 3 m is proposed subject to confirmation of operational and maintenance requirements of the manufacturer. Under no circumstance is the distance permitted to decrease to less than 1m.

(Note: * This is based on the NFPA 855 recommendation for a separation distance between units of 3ft or 914mm).

5.1.3 BESS to Site Boundary

As per the guidance in NFPA 855 section 9.5.2.6.1, the BESS should be separated by a minimum of 10 ft (3 m) from fences, buildings and other exposure hazards not associated with electrical grid infrastructure. The distance permitted may be reduced to 1.5 m (5ft) from site boundary to BESS enclosure where a 1-hour free-standing fire wall is provided. In the case of this site, the units will be located no closer than 3 metres to any fence line and therefore there is no need for a fire wall to be provided. Likewise, as there are no buildings located with 100 metres of the BESS units there is no requirement for a fire/blast wall.

5.1.4 Impact of Vegetation

NFPA 855 recommends at least 3metres between the BESS enclosure and vegetation and other combustible growth. Internally this is satisfied at Kirkby as the ground on site is predominantly gravel and no vegetation is proposed. The landscaping on the site will be managed and maintained on a regular basis to prevent the possibility of any wildfire occurring. External to the site, the perimeter fence is surrounded on three sides by scrubland, again the vegetation will be managed to ensure the risk of wildfire is reduced to as low as reasonably practicable.

5.2 Power Conversion Subsystems

The power conversion subsystems (PCS) comprise of an inverter, distribution equipment and transformer. NFPA 855 has no guidance for separation distances between the PCS and the BESS and separation distance are subject to the manufacturer's recommendations. Typically, this is based on the guidance given in IEC 61936-1, Power Installations Exceeding 1kV AC and 1,5 kV DC.

Similarly, the separation distance between the PCS and the site boundary will be dependent on the type of transformer associated with the PCS. Siting of the PCS from the boundary will be in accordance with the manufacturer's recommendations.

5.3 Auxiliary Transformers

Separation distances for the ancillary transformers will be as per the manufacturers recommendations and will be developed in full accordance with their requirements. Typically, this is as per the guidance in IEC 61936-1, Power Installations Exceeding 1kV AC and 1,5 kV DC and / or NFPA 850 as appropriate.

5.4 Switchgear Building and Control Room

The distance between BESS and the Switchgear Building and the Control Room shall be a minimum of 3 metres as per the recommendations given in NFPA 855, where the wall of the building is not a minimum of 60 minutes fire rated.

Separation distances between the buildings and the adjoining notional boundary will be designed in accordance with the guidance given in BS 9999.

6 Battery Control Systems

6.1 Control Architecture

The control and safety systems of BESS vary depending on the manufacturer. However, the selected system will have a Battery Management System (BMS) with built-in fail-safe automated algorithms.

The control and safety system will provide an effective and appropriate method of early detection of a fault of the batteries and consequent disconnection shall be provided when normal voltage or temperature limits are exceeded. Such limitation or disconnect would be alerted to the control room.

6.2 Control Room

The BESS will be monitored by the on-site control systems (SCADA or similar) as well as being monitored 24/7 by a remote offsite control room. The offsite control room will have the ability and authority to immediately shut BESS down should the need to do so arise. Upon detection of an overtemperature or fire incident, the alarm condition will be transmitted to a control room and an offsite control centre that will in turn send an alarm to the local fire and rescue service.

The exact operations will be developed as part of the Emergency Response Plan and the Battery Storage Safety (Operational) Management Plan.

7 Operational Management

7.1 Site Specific Risk Information (SSRI)

The Kirkby site will have a Site Specific Risk Information document developed in consultation with Merseyside Fire and Rescue Service. This will include, but is not limited to:

- Access and Egress routes.
- Emergency Contact details.
- Environmental risks.
- Hazardous substances, including type (UN number).
- Water supplies
- Buildings
- Firefighting facilities
- Sites of special scientific interest
- Flooding
- Transport
- Tunnels
- Utilities and Fuel
- Wildfires

7.2 Emergency Response Plan (ERP)

Kirkby BESS site will have a detailed emergency response plan, developed in consultation with Merseyside Fire and Rescue Service that includes (but not limited to):

- How the Fire Service will be alerted.
- Details of the BESS.
- Site drawings.
- Firefighting strategy.
- Firefighting water provisions and drainage strategy.

7.3 Site Risk Management Plan (RMP)

Kirkby BESS site will have a detailed Battery Storage Safety (Operational) Management Plan that includes:

- The site hazards and risks and their proposed management.
- Any infrastructure that may impact or delay the emergency response.
- Access to the facilities on site for emergency vehicles and responders.
- The proposed fire detection and suppression systems on site.
- Proposed maintenance requirements and responsible persons / entities.
- Decommissioning and safe transport / storage of decommissioned batteries.
- Security requirements and response plans.



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