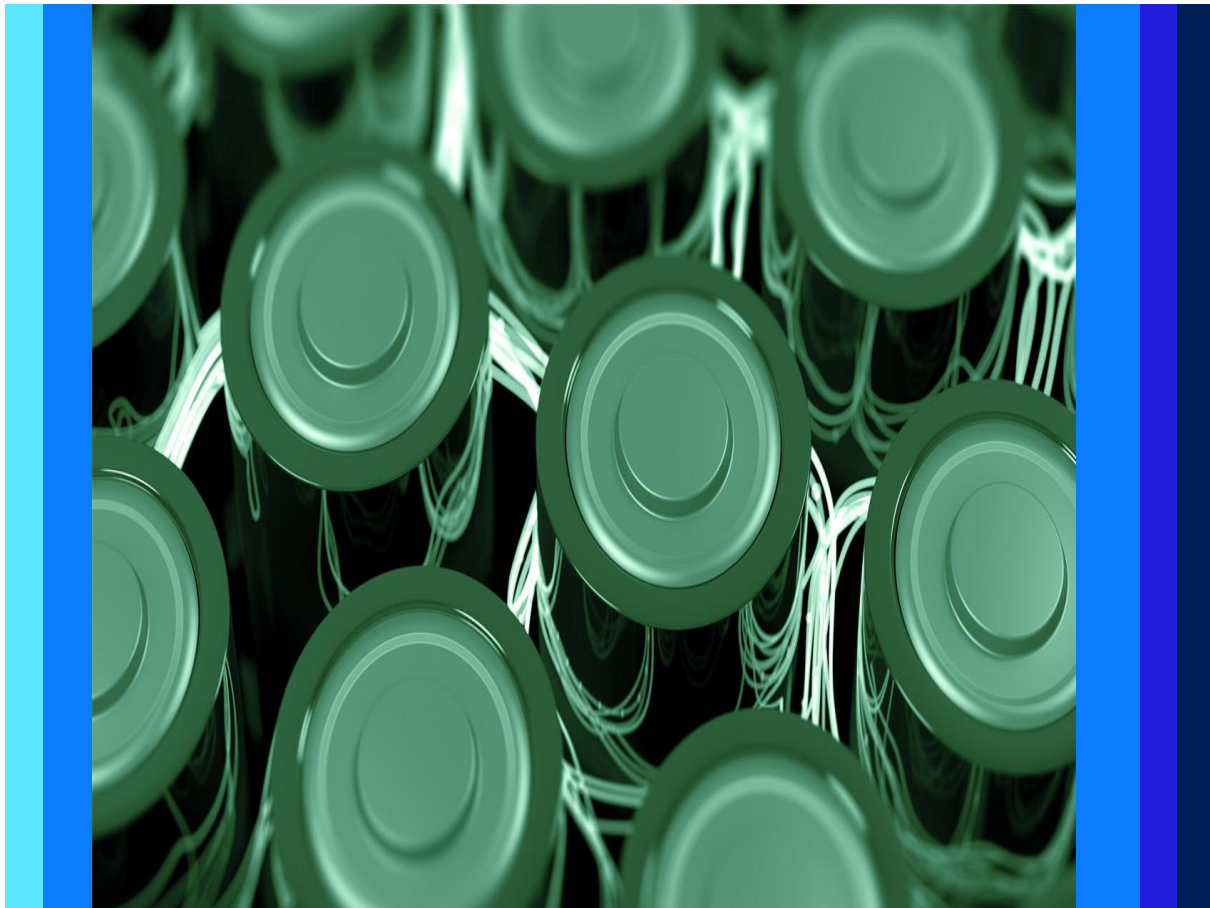


Kirkby BESS Fire Statement to Support the Planning Application

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Kirkby BESS Fire Statement to Support the Planning Application

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Executive summary

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

Only UL9540A tested BESS will be installed on-site to meet business continuity and property protection requirements.

The design and layout of the BESS within the site will 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 NFCC Guide: *Grid-Scale Battery Energy Storage System Planning* (2023).

Key points are:

- A 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 60 minute firewall is proposed along much of the site boundary where the recommended separation distance of 3m given in NFPA 855, is not met.
- A hammerhead is included in the roads on site to provide suitable Fire and Rescue Service vehicle access.
- Pollution control from fire-fighting water is achieved by providing an impermeable membrane below a gravel layer. This drains water run off to a attenuation tank. Water can be held in the tank until tested and safely disposed of.

As the battery manufacturer has not yet been determined, subsequent to this planning application, the following will be developed in conjunction with all interested stakeholders:

- Deflagration prevention / venting systems design and specifications.
- Battery Management System
- Emergency Response Plan for First Responders.
- Battery Storage Safety (Operational) Management Plan.
- Fire Safety Study Report.

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1. Introduction

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

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 fire and rescue service access, separation distances, firefighting water capabilities and firewater run-off. The guidance addresses the critical issues raised in the NFCC guidance on *Grid-Scale Battery Energy Storage System Planning* (2023).

It is noted that the BESS manufacturer has not yet been appointed. Some recommendations given in this technical note will be subject to further assessment to reflect specific BESS product's technical requirements.

It is assumed the site has restricted access, and any opening requirements must be considered in the Emergency Response Plan (ERP) to be developed in consultation with the Fire and Rescue Service (F&RS).

To ensure the highest fire safety standard all BESS must be tested to UL9540A *Test Method for Evaluating Thermal Runway Fire Propagation in Battery Energy Storage Systems*. In addition, it is a requirement to meet business continuity and property protection that 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 Site Location

2. System 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. Testing of BESS

All BESS installed on site at Kirkby must be UL9540A tested. 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.

3.1 Deflagration Prevention and Venting

BESS will have appropriate deflagration venting and explosion prevention installed. The results of the ventilation and deflagration prevention studies will be included as part of the Fire Safety Study.

4. Fire and Rescue Service Facilities

4.1 Vehicle Access

Roadways will be sized for fire and rescue pumping appliances and will exceed the guidance given in Table 20 of BS 9999 *Fire safety in the design, management and use of buildings - code of practice*.

Table 1. Fire Service Vehicle Roadway Minimum Requirements.

Appliance Type	Min. width of road between kerbs	Min. width of gateways	Min. clearance height	Min. carry capacity (tonnes)
Pump	3.7 m	3.1 m	3.7 m	12.5 t

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.

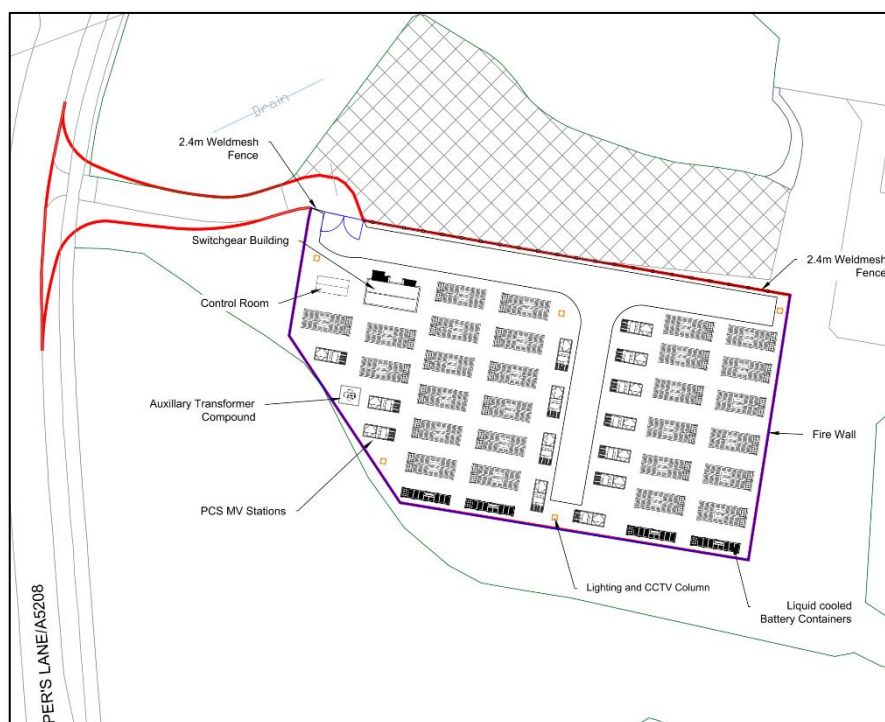


Figure 2. Layout of Kirkby BESS.

The Fire Service Vehicle access is provided to all parts of the site within 45m hose distance of parking positions on the site.

4.2 Fire Hydrant & Water Capabilities

It is proposed that the site will be connected to the water main, serving the statutory hydrant located on Coopers Lane, via a spur. (Figure 3), 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.

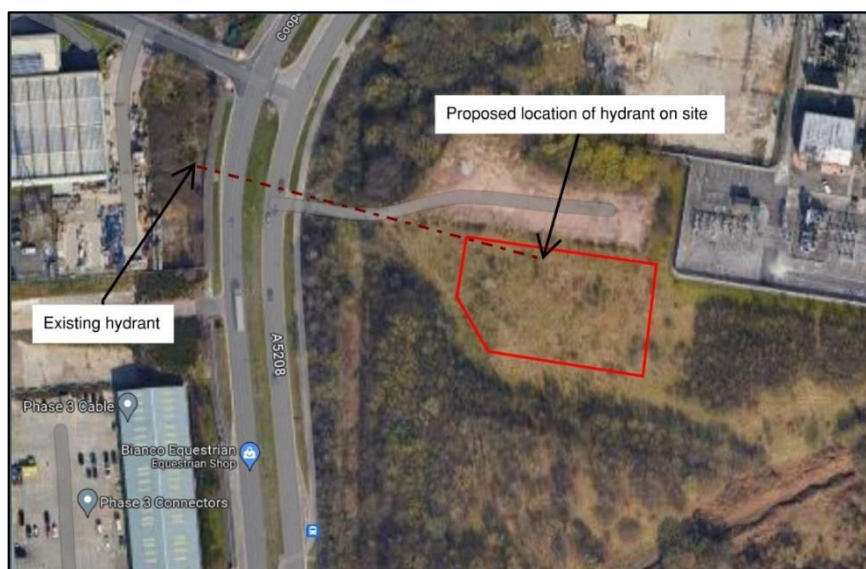


Figure 3. Fire hydrant location.

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 51m³ water attenuation storage tank, located underground beneath the access road, with a fire-fighting connection. This allows the fire and rescue service to 'recycle' water run-off as required. This is as recommended in CIRIA C736F *Containment systems for the prevention of pollution* and NFPA 855.

Signage of hydrants and inlets will be provided onsite and detailed in the Emergency Response Plan to allow rapid identification.

4.3 Firewater 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 site is designed to minimise the risk of fire water runoff entering the water table. Water on site is collected by an impermeable membrane below a gravel layer and the water then runs into the water attenuation storage tank. Excess water can be either removed by a specialist team or allowed to enter into a secondary bunded containment area. This is subject to development as part of the Emergency Response Plan.

5. Separation 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 in NFPA 855, to meet insurance requirements. The required separation distances are detailed below:

5.1 BESS

BESS can be provided either 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 Cabinets to Cabinet

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 Boundaries

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. This distance is permitted to be reduced to 1.5 m (5ft) from site boundary to BESS enclosure where a 1-hour free-standing fire wall is provided.

This fire wall should be a minimum height of 1.5 m greater than the height of the adjacent BESS enclosure (e.g. 3.9 m) and located no closer than 0.9 m to the wall of BESS unit.

5.1.4 Impact of Vegetation

NFPA 855 recommends at least 3m between the BESS enclosure and vegetation and other combustible growth. Internally this is satisfied at Kirkby and the ground on site is predominantly gravel and no vegetation is proposed. The site is surrounded on three sides by scrubland, and it is proposed that the provision of a - hour fire rated wall will mitigate against the threat posed by wildfire.

5.2 Power Conversion Subsystems (PCS)

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 Transformer

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 as well as being monitored 24/7 by a remote - control room. The control room will have the ability and authority to immediately shut BESS down should the need to do so arise. It will also be responsible for contacting the emergency services and relaying information to attending first responders.

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 Emergency Response Plan

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

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

7.2 Battery Storage Safety (Operational) Management Plan

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.