Peartree Hill Solar Farm

Outline Battery Safety Management Plan Revision ~~43~~ (tracked)

Application Document Ref: EN010157/APP/7.6

~~November 2025~~January 2026

Planning Act 2008

Infrastructure Planning

(Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulation 5(2)(q)

Contents

Acronyms

Acronym	Description
AC	Alternating current
BESS	Battery Energy Storage System
BMS	Battery Management System
BMV	Best and Most Versatile
BSMP	Battery Safety Management Plan
CEMP	Construction Environmental Management Plan
DC	Direct current
DCO	Development Consent Order
Draft DCO	Draft Development Consent Order
EIA	Environmental Impact Assessment
ERP	Emergency Response Plan
ERYC	East Riding of Yorkshire Council
ES	Environmental Statement
FRS	Fire Rescue Service
HL	Hazard Log
HVAC	Heating, Ventilation and Air Conditioning
kV	Kilovolts
LEMP	Landscape and Ecological Management Plan
LFP	Lithium Iron Phosphate
Li-Ion	Lithium-Ion
LPA	Local Planning Authority
MW	Megawatts
NFCC	National Fire Chiefs Council
NSIP	Nationally Significant Infrastructure Project
NMC	Lithium Nickel Manganese Cobalt
OEM	Original Equipment Manufacturer
OEMP	Operational Environmental Management Plan
PA 2008	Planning Act 2008
PV	Photo voltaic
SoS	Secretary of State for the Department for Energy Security and Net Zero

Glossary

Term or Abbreviation	Definition
The Applicant	RWE Renewables UK Solar & Storage Ltd.
DCO Application	Development Consent Order application.
East Riding of Yorkshire Council	Host authority for the Proposed Development.
Battery Energy Storage System (BESS)	BESS is designed to provide peak generation and grid balancing services to the electricity grid. It will do this primarily by allowing excess electricity generated from the solar PV panels to be stored in batteries and dispatched when required. It may also import surplus energy from the electricity grid
Development Consent Order (DCO)	An order granted by the Secretary of State permitting the development of a Nationally Significant Infrastructure Project. DCO applications are made to the Secretary of State via the Planning Inspectorate.
Environmental Impact Assessment (EIA)	A statutory process by which information about environmental effects of a proposed development is collected, assessed and used to inform decision making. The EIA for the Proposed Development has been undertaken in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (hereafter referred to as the 'EIA Regulations').
EIA Regulations	The EIA Regulations relevant to the Proposed Development are the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended). The EIA Regulations specify which developments are required to undergo EIA.
Environmental Statement (ES)	A report forming part of the DCO application, it will report the process and final outcomes of the EIA and explain the likely significant effects of the Proposed Development on the environment once mitigation measures have been taken into account.
Construction Environmental Management Plan (CEMP)	A site-specific plan developed to ensure that appropriate environmental management practices are followed during the construction phase of a project.
Construction Traffic Management Plan (CTMP)	A plan which sets out the Applicant's management practices for construction traffic and staff vehicles during the construction of the Scheme.

Land Area	A site within the red line boundary that is proposed for solar panels, and associated infrastructure.
Local Planning Authority (LPA)	Local government body and consultee for the Proposed Development.
Mitigation	Measures including any process, activity, or design to avoid, prevent, reduce, or, if possible, offset any identified significant adverse effects on the environment.
Megawatt (MW)	Unit of power equal to one million watts.
Nationally Significant Infrastructure Projects (NSIP)	NSIPs are large scale developments such as certain new harbours, power generating stations (including solar farms), highways developments and electricity transmission lines, which require a development consent under procedures governed by the Planning Act 2008.
Order Limits	Land shown on the Works Plans within which the Proposed Development can be constructed and operated.
Planning Act 2008 (PA 2008)	Primary legislation outlining the consent regime for major infrastructure projects in the fields of energy, transport, water, wastewater, and waste.
Secretary of State (SoS)	Secretary of State for Energy Security and Net Zero.

1 Introduction and context

1.1 Introduction

1.1.1 This document provides the Outline Battery Safety Management Plan ('BSMP') for the design and operation of Peartree Hill Solar Farm (the 'Proposed Development').

1.1.2 RWE Renewables UK Storage and Solar Ltd (the 'Applicant') has prepared this document as part of an application for a Development Consent Order ('DCO') for the construction, operation (including maintenance) and decommissioning of the Proposed Development.

1.1.3 The Outline BSMP has been produced in order to respond to the risks and concerns around the potential for a battery fire event in the Battery Energy Storage System ('BESS'). It sets out proposals for:

- Minimising the chances of a battery fire event through design measures;
- Minimising the chances of fire spread in the event of a fire through design and operational measures; and
- Setting out the proposed operational response to a fire event.

1.1.4 This Outline BSMP is prepared on the assumption that a BESS using Lithium Iron Phosphate ('LFP') battery technology will be adopted for the Proposed Development. The BESS will be designed in accordance with the UK and internationally recognised good practice guidance and standards available at the time of writing and take into account any advancements in technology.

1.1.5 An EIA has been undertaken for the Proposed Development and an **Environmental Statement** ('ES') **[EN010157/APP/6.1–6.4]** has been prepared in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations). In accordance with the EIA Regulations, the ES contains the assessment of the likely significant effects on the environment that may be caused during construction, operation and decommissioning of the Proposed Development and describes proposed mitigation measures.

1.1.6 Prior to the commencement of any part of the Proposed Development involving the BESS, a BSMP will be produced for the Proposed Development. In compliance with the Requirements in the **Draft DCO [EN010157/APP/3.1],** the BSMP must approved by the Local Planning Authority following consultation with the local Fire and Rescue Service and be substantially in accordance with this Outline BSMP.

1.2 Scope of the BSMP

1.2.1 The Outline BSMP identifies the key standards, guidelines, and principals the Applicant will adhere to during the detailed design and operation of the BESS within the Proposed Development.

1.2.2 The BSMP will be substantially in accordance with this Outline BSMP and will take into account any advancements in technology and updated legislation and guidance available at that time.

2 The Proposed Development

2.1 Description of the Proposed Development

2.1.1 The Proposed Development consists of a solar photovoltaic ('PV') array electricity generating facility and BESS including solar PV modules and mounting structures, on-site supporting equipment including inverters, transformers, two on-site substations and underground cabling to connect to the National Grid Creyke Beck Substation, associated infrastructure including fencing, drainage, and storage containers and biodiversity and landscaping enhancement measures, together with temporary development during the construction phase. The Proposed Development will have the capacity to generate over 50 Megawatts (MW) of electricity.

2.1.2 A full description of the Proposed Development is provided in **ES Volume 1, Chapter 3: Proposed Development Description [EN010157/APP/6.1].**

2.2 Proposed Development Location

2.2.1 The entirety of the Proposed Development is located within the administrative boundary of East Riding of Yorkshire Council ('ERYC').

2.2.2 The land within the Order Limits predominantly consists of agricultural fields (mostly arable with some grassland) interspersed with hedgerows, ditches, small woodland blocks and farm access tracks. The fields are bordered by a mix of hedgerows, wet ditches and some of the many major named drains and dykes in the area, including Monk Dike and Holderness Drain.

2.2.3 The Order Limits for the Proposed Development are shown on the **Location and Land Areas Plan [EN010157/APP/2.1].**

2.3 Battery Energy Storage System

2.3.1 The indicative design of the Proposed Development, which forms the working assumption of this outline BSMP, includes BESS housed in outdoor containers. The containers will house LFP batteries (in cells, arranged in modules which are in turn arranged in racks as well as Heating, Ventilation and Air Conditioning ('HVAC'), Battery Management Systems ('BMS'), temperature and smoke alarms, fire detection and suppression systems and deflagration venting as seen in **Plate 1-1**.

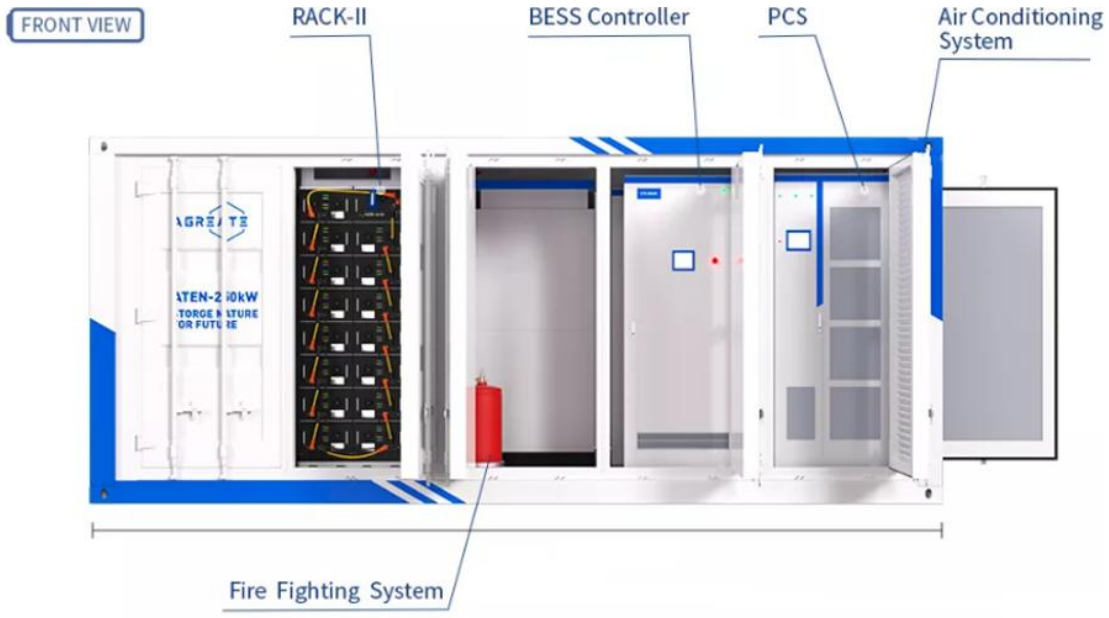

Plate 1-1: Sample of a BESS container (Source: Agreate)

2.3.2 The **Draft DCO [EN010157/APP/3.1]** includes a requirement for the detailed design of the Proposed Development to be in accordance with the **Design Parameters Document [EN010157/APP/5.8]** which defines the parameters that will inform the detailed design of the BESS.

2.3.3 LFP has become the favoured cell chemistry in recent years. LFP cells operate at higher temperatures than other cell chemistries and are at lower risk of thermal events such as burn-through (a process by which one cell ignites and adjacent cells catch on fire) and thermal runaway (a process resulting in a self-sustaining fire that persists even if outside sources of electricity are removed).

2.3.4 Thermal runaway (generally seen as the worst-case scenario for a BESS fire) can be distinguished from electrical fires which can be the result of short circuits or other minor faults. The risks are separate, and the mitigation is therefore separate for each possible risk. These risks are dealt with in **Section 5** of this document.

2.3.5 The risk of an LFP battery suffering from thermal runaway can be mitigated through good design, testing, operation, ventilation, monitoring and cooling systems. This Outline BSMP set out how this risk will be mitigated.

3 NFCC Guidance

3.1.1 The National Fire Chiefs Council (NFCC) issued guidance **[Ref. 3-1]** in relation to Grid Scale BESS in November 2022. This guidance was designed for developers and Local Planning Authorities to consider elements of BESS schemes which could be amended to reduce the risk of fire, and ensure that should an adverse incident occur, that Local Fire and Rescue Services are well supported in their response.

3.1.2 The NFCC guidance document has a number of points that developers should consider in the design of their sites (inter alia):

- Access to the site;
- Suppression devices;
- proximity to vegetation;
- Information boards for emergency plans;
- BESS layout;
- Isolation equipment employed; and
- Emergency vehicle access design.

3.1.3 **Table 1** of Appendix A summarises the relevant guidance from the National Fire Chiefs' Council (NFCC) and sets out how the Proposed Development responds to the recommendations raised.

3.1.4 The NFCC guidance was used as a framework for consultation with Humberside Fire and Rescue Service (Humberside FRS) (see Section 4 below).

3.1.5 Other standards and guidance of relevance to the design and operation of BESS are addressed in Section 7.

4 Consultation

4.1.1 The Applicant has worked closely with technical experts in collating the technical and safety information necessary for the safe and optimal design, procurement, construction, and operation of the BESS, and will continue to do so.

4.1.2 The Applicant has consulted with Humberside FRS, on the preparation of this Outline BSMP. An initial meeting was held in March 2024 where the Proposed Development was outlined and the key design and management procedures relevant to fire risk explained. At this meeting, Humberside FRS posed a number of queries relating to the system design and construction. These queries, alongside responses from the Applicant and where the detail is provided within this Outline BSMP or other documents that form part of the DCO Application are outlined in **Table 2** in Appendix A.

5 Design Safety and control measures

5.1.1 The below section covers the various safety features which the Applicant will incorporate into the design of the Proposed Development where reasonably practicable to help reduce the risk of a major incident.

5.1.2 These safety features will need to take into consideration the final selection of BESS.

5.2 Heating, Ventilation and Cooling (HVAC)

5.2.1 Temperature and humidity within each BESS container must be carefully controlled, both to avoid excessive degradation of the energy capacity and to remove excess heat that can cause breakdowns or lead to fires. BESS manufacturers typically provide specific limits for the maximum and average yearly container temperature and average hourly temperatures. It is important to monitor temperature at various points within the container to ensure the air (if the solution is using air cooling) or the liquid medium (if the solution is using liquid cooling) is circulating properly and there are no hotspots in certain parts of the container.

5.2.2 A suitable BESS with the appropriate HVAC will be installed and it will be operated and maintained in accordance with the recommendations of the manufacturer and good industry practice.

5.3 Battery Management System and fire detection

5.3.1 All BESS units are equipped with a BMS, which is typically provided by the BESS supplier. The BMS is designed as a three-level system which monitors and manages operational and safety parameters at the cell, module and rack level. This ensures that quick and effective remedial action can be taken automatically if an issue is identified even at the individual cell level.

5.3.2 The BMS continuously monitors all essential data associated with each sub-component of the BESS, including current, voltage and temperature. The Applicant will review data from the BMS system.

5.3.3 The Applicant will ensure that the fire detection system provided by the BESS supplier will be certified to the relevant industry standards.

5.3.4 The fire detection system and monitoring of alarms will be managed by the Applicant.

5.4 Fire suppression

5.4.1 If a fire occurs within a container, an automated fire suppression system is triggered. The fire suppression system design can be based on water sprinklers, a clean agent (aerosol or gas system), or a combination of both. In order to minimise the potential for contamination to groundwater the fire suppression system will not use per- and polyfluoroalkyl substances (PFAS).

5.4.2 The Applicant will use an automatic clean agent rather than water-based system for the Proposed Development as this is regarded as good practice for a number of reasons:

- Flooding a container with water will almost certainly destroy the electrical equipment within it and is not considered an appropriate solution for combatting electrical fires.
- While the application of water is a straightforward way to reduce temperatures, this does not essentially remove the issue of thermal runaway and is not always a practicable solution as large volumes of water are required to suppress a thermal runaway fire, requiring large on-site water storage or fire hydrants.
- If a container is flooded, there is a risk for contaminated water to leak into the surrounding area and cause contamination, this requires specific fire water containment to be installed and leads to increased costs and design complexities.

5.4.3 Emergency response personnel will be appropriately trained to handle containers that use clean agent fire suppression.

5.4.4 At the entrance to the Proposed Development there will be an information box which contains details of each battery on site and its exact location, its chemical make-up, and any details from the manufacturer about how to tackle a fire from the unit, as well as information about the fire suppression systems installed.

5.4.5 The spread of fires will be assessed via a fire risk assessment and mitigated by allowing sufficient space between the BESS containers and other site infrastructure. A spacing of at least 3 m will be provided between BESS containers and two sides of access to the containers maintained for local fire service access.

5.4.6 Further details on the steps taken to minimise fire risk is detailed in **Table 3** in Appendix A. A list of other standards that would be expected for the BESS is detailed in Section 7 below.

5.5 Deflagration

5.5.1 The BESS containers will follow National Fire Protection Association (NFPA) 68 standards, which are equipped with deflagration panels that are designed to direct the force of an explosion upwards in the event of high-pressure gases building up inside the container. Venting upward, rather than outward, reduces the risk of damage to adjacent equipment or injury to first responders.

5.5.2 **Plate 1-4** below illustrates a sample deflagration venting arrangement on a BESS container.

Plate 1-4: Sample deflagration venting on BESS container (Source: Fike Corp)

5.6 Access

5.6.1 The BESS will be designed to follow fire safety best practice which at the time of preparing this Outline BSMP will see the BESS accessed purely from the outside. This reduces the risk of injuries to maintenance staff and first responders in the event of a fire. A sample access arrangement for the proposed BESS is shown in **Plate 1-5**.

Plate 1-5: BESS access from the outside (Source: NREL)

5.7 Contamination and avoidance of water suppression

5.7.1 Water would be used only to cool areas adjacent to a BESS container to prevent fire spread, water will not be used to suppress a battery fire within a BESS container which will be suppressed using an aerosol-based fire suppression (see above). This approach will avoid the risk of firewater runoff becoming contaminated with chemical substances contained in the batteries.

5.7.2 A Battery Safety Management Plan submitted for approval in accordance with Requirement 8 of the **draft DCO [REP6-006]** will include:

- Details of the operation and maintenance of the proposed penstock valves detailed in sections 3.5.50 and 3.5.51 of **ES Volume 4, Appendix 5.5: Water Framework Directive Screening and Scoping Report [REP5A-007]**.
- Details of sampling and testing methodology for pollution analysis of water retained at the penstock valves (in the event of a fire at the connected hybrid compound).
- Details of sampling and testing methodology for pollution analysis of the gravel and sand layer (in the event of a fire at the connected hybrid

compound). Should contaminants be positively identified, contaminated materials will be fully removed to prevent the risk of secondary contamination further causing pollution to controlled waters.

- Details of locations where any drainage system are proposed to discharge to groundwater and/or surface waters.

5.8 Layout considerations and benefits of DC coupling

Landscaping

5.8.1 Regular vegetation management is key to mitigating the risk of any fire spreading across the site and this will be carried out as part of the Solar PV maintenance.

5.8.2 The layout will take vegetation and landscape screening into consideration to ensure that whilst landscape visual mitigation is incorporated there is no additional risk to the BESS units. The **Outline Landscape and Ecological Management Plan (LEMP) [EN010157/APP/7.5]** also commits to the grass around the BESS units remaining trimmed on a more frequent basis than compared to other elements of the Proposed Development like the wildflower meadow.

Site access and layout

5.8.3 In order to allow fire vehicles to remain in forward gear and not need to undertake a three point turn within the site, a number of turning circles will be provided. The location of these will be on maps at the site entrance so that fire and rescue services can understand how to navigate the site.

5.8.4 The road perimeter will be of a grade suitable of accommodating the weight of a fire and rescue service vehicle.

5.8.5 The Proposed Development is designed on a DC-coupled basis, whereby the BESS and solar modules share the inverter/transformer stations. As a result, the BESS containers are distributed across the entire site, with each BESS container being immediately adjacent to an inverter/transformer station.

5.8.6 From a fire safety perspective, a DC coupled scheme reduces the risk of a widespread fire event as it is much less likely that a fire in an individual BESS container could spread to another container, compared to an AC-coupled scheme. In accordance with industry best practice at least 3m spacing will be maintained between containers.

5.8.7 The Applicant will engage with the emergency response services to ensure that there is suitable access to each of the container locations, and that individual containers can be clearly identified in the case of a fire incident.

5.8.8 Notice boards will be placed at all entrances showing the exact location of the BESS with respect to the overall site, showing the shortest route to other parts of the site and detailing the agreed procedure to manage an emergency situation.

5.8.9 At least 3 m spacing will be left between the inverter station and BESS within each pair. This would reduce the risk of a BESS fire incident damaging the adjacent inverter as well.

5.8.10 Proof of certification and testing of the BESS will be obtained from the chosen manufacturer prior to installation of BESS for the Proposed Development.

5.9 Certification and testing of the BESS

5.9.1 UL9540A is an internationally recognised test method for evaluating thermal runaway fire propagation in BESS. It was first published in 2017 and is regularly updated to reflect the maturing BESS market.

5.9.2 Ultimately, UL9540A testing services to demonstrate that the risk of thermal runaway starting with an individual cell is minimal, and that in the rare case of a thermal event the BESS is adequately designed to contain and suppress the fire.

5.9.3 When procuring a BESS, it is essential to confirm that the selected technology has been tested according to UL9540A at all relevant levels (cell, module, and unit).

5.9.4 The Applicant will obtain UL9540A test results at the installation level, which assess the effectiveness of the fire and explosion mitigation methods of the BESS.

5.9.5 The Applicant will procure, install and operate the BESS as per these industry standards and good industry practices.

Information boxes

5.9.6 At all entrances to the Proposed Development there will be an information box which will contain information that will be shared with the emergency services ahead of the Proposed Development becoming operational but will be located in hard copy on site to ensure that any responder is aware of the assets on site.

5.9.7 The information box will contain information covering:

- A map of the site and location of different assets including BESS;
- Manufacturing details of all assets including any on site fire suppression equipment, including those inbuilt to assets;
- Chemical content information for the batteries;
- Make, model, and details of all batteries on site;
- Manufacturers recommended course of action in the event of a fire (if available);
- Contact details for the operator of the site; and
- Location of emergency isolation points.

5.10 Summary of design safety and control measures

5.10.1 The below safety features will be incorporated within the BESS units and wider design:

- The Applicant will ensure that any system selected will comply with international test method UL9540A, which demonstrates the fire propagation for LFR batteries at cell, module and unit level. BESS with appropriate HVAC will be installed to monitor, regulate and control the operating temperature of the batteries with inbuilt isolation trips in case of temperatures which deviates from the approved allowance and cannot be rectified.
- All BESS to be equipped with a BMS to monitor and manage operational and safety parameters at the cells, module and rack level.
- Automatic clean agent (aerosol or gas system) fire suppression system design to be used.
- BESS containers to follow NFPA 68 standards with deflagration panels directed upwards as opposed to outwards.
- BESS will be accessed externally.
- Layout design to limit the proximity of batteries to each other with 3m spacing between containers.
- Certification and testing of procured materials as described in section 5.9.
- Information Boxes at the site entrance containing hard copies of information share with the emergency services detailing the site location, layout, and information relevant for the assets on site.
- Layout of BESS will take vegetation (both proposed and existing) into consideration to ensure there is no additional fire risk.
- Access points and roads will be designed to enable access by a fire and rescue service vehicle and turning circles provided.

6 Operation - Safety management and control measures

6.1.1 The below section covers the various safety management and control measures the Applicant will follow where reasonably practicable during the operation of the Proposed Development to help reduce the risk of a major incident where applicable.

6.2 Emergency Response Plan

6.2.1 As part of the initial development, an Emergency Response Plan ('ERP') will be developed, in conjunction with Humberside FRS, that outlines how the Applicant will respond to incident and accident scenarios at the site. This includes the interfaces with external first responder organisations. The ERP is iterative in approach and will be developed in parallel with technical safety requirements. This ensures that the site design and ERP are properly integrated, and that appropriate information can be provided to first responders to include in their planning activities.

6.3 Hazardous Material

6.3.1 Any hazardous materials held and stored at the BESS facility will be fully justified and will be detailed in the ERP, detailing the location, description, precautions to be adopted and quantity.

6.4 BESS Hazard Log

6.4.1 A BESS Hazard Log will be used to provide an auditable record of all decisions made for the assessment of risk for the BESS which will be managed through life of the Proposed Development.

6.5 Safety Management Structure

6.5.1 The BESS safety management structure will be prepared subject to the safety management strategies and procedures that are in place with the successful supplier and installer of the BESS. As a minimum the safety management structure will ensure safety management and environmental risk is at the forefront of products, procedures, and services.

6.6 Overarching Policy

6.6.1 All BESS development activities shall consider safety and environment as an integrated part of the BESS life cycle and shall be assessed from a safety viewpoint. This encourages and develops a safety and environmental culture that spans all levels of the organisation and encompasses all aspects of its working practices. It views safety as a holistic quantity that is owned by the organisation rather than something to be passed by function. This safety culture will be supported by training to develop and maintain expertise and awareness for good

practice, knowledge of emerging standards and in the understanding of legislation.

6.7 Staff Competence

6.7.1 All personnel who have responsibility for ensuring the safe operation and/or appropriate environmental management of the BESS will be competent to discharge those responsibilities or will be adequately supervised/approved by someone with appropriate competencies.

7 Relevant standards and regulations

7.1.1 There are many design standards relevant to BESS design and safety which will be complied with where appropriate. This section lists these standards for reference.

Table 1 General Standards

Regulation/Requirement	
Health and Safety at Work Act 1974;	
The lifting operations and lifting equipment regulations 1998 (LOLER)	
Provision and Use of Work Equipment Regulations 1998 (PUWER)	
Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR)	
Workplace (Health, Safety and Welfare) Regulations 1992	
Personal Protective Equipment at Work Regulations 1992	
Management of Health and Safety at work regulations 1999	
The regulatory reform (fire safety) order 2005	
The Fire Regulations 2022	
Fire Safety in Construction Work (HSG168)	
The Construction (Design and Management) Regulations 2015 (CDM 2015)	
Compliance with the rules, regulations, installation and O&M Manuals	
Standard	**Definition**
ISO 9001:2015	Quality Management Systems
ISO 31000	Risk Management
ISO 14001:2015	Environmental Management Systems
ISO 27001:2022	Information Security Management Systems

ISO 45001:2018	Occupational health and safety management systems

Table 2 Design and Installation Standards – Transportation standards

Standard	Definition
UN38.3	Transport of Lithium metal and Li-Ion batteries
UN3480	Li-Ion Batteries
IEC 62281:2019	Safety of primary and secondary lithium cells and batteries during transport

Table 3 Design and Installation Standards – Fire protection standards

Standard	Definition
NFPA 855	Standard for the installation of stationary energy storage systems.
NFPA 68	Standard on explosion protection by deflagration venting
BS EN 54	Fire detection and fire alarm systems
BS EN 15276	Fixed firefighting systems
UL 9540	Standard for energy storage systems and equipment.
UL 9540A	Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems.
NFCC Guidance	Grid Scale Battery Energy Storage System Planning

Table 4 Battery energy storage system standards

Standard	Definition
IEC 61427	Secondary cells and batteries for renewable energy storage for on-grid applications
IEC 60050-482:2004/AMD2:2020	International Electrotechnical Vocabulary
IEC 60050-631	International Electrotechnical Vocabulary – ESS
IEC 62485-1	Safety requirements for secondary batteries and battery installations
IEC 62485-2	Safety requirements for secondary batteries and battery installations
IEC 62485-5	Safety requirements for secondary batteries and battery installations
IEC 62619:2022	Secondary cells and batteries containing alkaline or other non-acid electrolytes
IEC 62620	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Large format secondary Lithium cells and batteries for use in industrial applications
IEC 62933	Electrical Energy Storage (EES) systems
IEC 62933-1	ESS: Terminology
IEC 62933-5-1 EES	Safety considerations related to grid integrated ESS

IEC 62933-5-2 EES	Safety considerations related to grid integrated ESS – electrochemical
IEC 62933-2 EES Part 2-1	Unit parameters and testing methods – general specification
IEC 62933-2 EES Part 2-2	Unit parameters and testing methods - Application and performance testing
IEC 62933-3 EES	Planning and Installation
EN 62933-4 EES	Environmental Issues
IEC 63056:2020	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries for use in electrical ESS
EUR 2016/631	Requirements for grid connection of Generators (RfG)
UL 1741/SA	Standard for Inverters, Converters, Controllers, and Interconnection System Equipment for use with Distributed Energy Resources
IEC 62477	Safety requirements for power electronic converter systems and equipment
IEC 62116	Test procedure of islanding prevention measures for utility-interconnected inverters
IEEE P2030.3	Standard for test procedures for electric energy equipment and systems for electric power system applications
UL 1642	Standard for Safety – Lithium Batteries
UL 1973	Standard for Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications
IEEE 1375	Guide for the Protection of Stationary battery systems
IEEE 1657-2018	Recommended Practice for Personnel Qualifications for Installation and Maintenance of Stationary Batteries
IEEE 1679-2020	Recommended Practice for the Characterisation and Evaluation of Energy Storage technologies in Stationary Applications
IEEE 2030.2.1-2019	Guide for Design, Operation, and Maintenance of Battery Energy Storage Systems, both Stationary and Mobile, and Applications Integrated with Electric Power Systems

8 References

- **[Ref 3-1]** Grid Scale Battery Energy Storage System planning – Guidance for Fire and Rescue Services, National Fire Chiefs' Council, November 2022, Available online. https://nfcc.org.uk/wp-content/uploads/2023/10/Grid-Scale-Battery-Energy-Storage-System-planning-Guidance-for-FRS.pdf

APPENDIX A

Table 1: NFCC Recommendations Cross References to the Proposed Development

NFCC Recommendation	Status	Comment
Access - Minimum of two separate access points to the site	Compliant with Caveat	Access to the BESS compounds is at various points as seen in **ES Volume 3, Figure 3.5 Indicative Construction Layout Plan [EN010157/APP/6.3]**. Given the expansiveness of the site and the individual service roads leading to each compound it is not envisaged that access route will be obstructed by smoke / plume.
Roads/hard standing capable of accommodating fire service vehicles in all weather conditions. As such there should be no extremes of grade	Compliant	The proposed access road serving the sites will be a crushed stone surface and is a minimum of 4.5 m in width. There is no extreme of grade at the site. Access roads have been subject to vehicle tracking and is considered suitable for FRS vehicles. Swept Path Analysis has been conducted, using RB32 data, and the roads at the site require to withstand site construction vehicle traffic more than 20 tonne gross vehicle weight. All roads will be maintained throughout the life of the site.
A perimeter road or roads with passing places suitable for fire service vehicles	Compliant	The BESS compound access road is a minimum of 4.5m wide hard surface access running through the site allowing access to all BESS units. At intervals along the site access track there are 'hammerheads' that allow vehicles to pass or turn around.
Road networks on sites must enable unobstructed access to all areas of the facility	Compliant	The access road runs around the site enabling access to the BESS compounds and associated infrastructure.

NFCC Recommendation	Status	Comment
Turning circles, passing places etc. size to be advised by FRS depending on fleet	Complaint	The access road upon entry to the site has a holding / assembly point for FRS appliances and other emergency vehicles.
Distance from BESS units to occupied buildings & site boundaries. Initial min distance of 25 m	Compliant	There are no occupied buildings within 25 m of the BESS compounds.
Access between BESS unit – minimum of 6.0 m suggested. If reducing distances, a clear, evidence based, case for the reduction should be shown	Compliant	The suggested 6 m separation is based on a 2017 Issue of the FM Global Loss and Prevention Datasheet 5- 33 in the NFCC. This datasheet was revised in July 2023 and now details the following: "For containerised Lithium-Ion BESS comprised of LFP cells, provide aisle separation of at least 5 ft (1.5 m) on sides that contain access panels, doors, or deflagration vents". This separation of 1.5m for LFP BESS is further articulated and supported in the Department for Energy Security and Net Zero Health and Safety for Electrical Energy Storage Systems. The BESS units for the Proposed Development are anticipated to be LFP and the distance between each BESS unit is 3 m, with the units being orientated such that no vents are opposite each other, ensuring compliance against the updated FM Global Specification.
Site Conditions – areas within 10 m of BESS units should be cleared of combustible vegetation	Compliant	Although on a greenfield site, the BESS and other installations will be positioned on concrete plinths and the land between the infrastructure laid out to a gravel covering.

NFCC Recommendation	Status	Comment
Water Supplies	Compliant with caveat	The water supplies requirement set out in the NFCC Planning Guidance when applied to a de-centralised DC-coupled battery arrangement is not proportionate. No water storage is proposed on site as sufficient water can be carried by FRS appliances for a DC-coupled battery site for boundary cooling purposes.
Signage	Compliant	Signage will be positioned at the entrance to the site, including a site layout plan and the contact details of key personnel. Signage indicating the access routes to the two pedestrian gates will be positioned at the holding / assembly point prior to the compound access.
Environmental Impacts	Compliant	The environmental impacts of the Proposed Development have been assessed and are reported in the **ES [EN010157/APP/6.1–6.4]** submitted with the DCO Application, together with a suite of mitigation measures to ensure any adverse effects are appropriately avoided or minimised. Engagement on the assessment and proposed mitigation measures has been carried out with the relevant statutory environmental bodies.
Emergency Plans	Compliant	An ERP will be developed for the site in conjunction with the Humberside FRS as part of the BSMP, as set out in section 6.2.
System design, construction, testing and decommissioning	Compliant	Details will be contained in the BSMP. The Applicant considers that the Proposed Development is compliant with this recommendation at this juncture in the planning process.

NFCC Recommendation	Status	Comment
Deflagration Prevention and venting	Compliant	Deflagration venting is considered most effective when fitted to the roof of the BESS units, as such deflecting blast upwards and away from FRS personnel, as per the approach set out in section 5.5.

Table 2: Humberside Fire and Rescue Service Consultation

Element Consulted upon	Applicant Response
What is the plan for fire supply water?	The Proposed Development is not proposing fire water supply. As set out in section 5.4 of this document, the intention is to use an automatic clean agent rather than water-based system.
Further detail on how Land Area A would be accessed during flood events?	Since initial engagement with Humberside FRS Land Area A has been removed from the Order Limits.

Element Consulted upon	Applicant Response
Access to BESS	The BESS will be dispersed across each of the land areas rather than being located centrally. While two accesses have not been proposed for each BESS location, there is the ability to approach on foot from different directions if the wind is blowing down the road. The layout has also been designed so that, if a BESS fire did occur, turning places for emergency vehicles are located before the BESS. Wind direction: Positioning of the BESS stations makes sure the most common prevailing wind direction does not cross the site entrance within 25-50m. This is where the modelling says they will be able to see clearly through the smoke plume/the smoke plume has risen to a level where it does not affect driving/walking. This will always allow the Humberside FRS to drive and park onsite and not leave them on the highways. BESS will be located at least 200 m from residential properties and more than 10 m from any vegetation.
Fire Strategy during construction	The **Outline Construction Environmental Management Plan (CEMP) [EN010157/APP/7.2]**, submitted as part of this application, sets out that an emergency response plan will be developed in consultation with the local fire service and that the final CEMP (secured by a requirement of the **Draft DCO [EN010157/APP/3.1]**), would detail the procedures for responding to incidents and emergencies on site.
Do BESS have built in fire suppression	Yes, automated fire suppression would be built into the Proposed Development. This is set out in section 5.4 of this document.

Element Consulted upon	Applicant Response
Isolation points for different areas, is it zoned	Yes – the Proposed Development has been designed so that areas/inverters/BESS can be isolated. This can be monitored both remotely and manually.

Table 3: Matrix of safety measures

Project stage	Fire Department	Location/Layout	Equipment	Operation and maintenance
Feasibility	Identification of the local FRS.	Identification of proximity to buildings, trees, utilities. Identification of prevailing wind direction and site conditions. Identification of potential access routes. A preliminary site layout is prepared based on best industry practices. These include a minimum of 3m from each BESS enclosure and other project equipment or structures. Where practically feasible, guidance from National Fire Chiefs Council on battery storage is followed for the preliminary design.	Battery technology selected. This is expected to be LFP. A preliminary list of battery suppliers is drafted and reviewed. The battery is housed in enclosures with a suitable fire rating. The enclosures will be accessed from the outside with no personnel entering the enclosures.	The design is developed while considering safety and ease of access and maintenance of the batteries.
Planning	Preliminary engagement with the relevant FRS Develop ERP with local FRS.		Refine design while considering feedback from the FRS. Where minimum spacing cannot be provided thermal barriers will be used in accordance with applicable codes and standards.	
Procurement	The requirements for procurement (including both suppliers and contractors) are developed based on planning requirements, recommendations from the FRS and industry leading technical and safety requirements.	The final design and selected equipment will adhere to all relevant international codes and standards. Equipment is procured from Tier 1 suppliers who have a good safety track record for BESS projects. The procured equipment will have: suitable and automated cooling, ventilation, fire detection (heat and smoke) and fire suppression systems; Combustible gas sensors; Deflagration vents; and		The enclosures will comprise a three level BMS that will monitor cell, module and rack level data. This ensures that quick and effective remedial action can be taken automatically if an issue is identified at each level

Project stage	Fire Department	Location/Layout	Equipment	Operation and maintenance
	The preferred supplier/contractor (once selected) and local FRS interact and discuss the solutions and designs. Continue to develop ERP in line with design progression.	Appropriate HVAC to maintain temperature control; Once the equipment and design is finalised, a fire risk assessment is carried out to identify scope and scale of fire spread. Where a change to the design is required to further reduce fire risk, as identified in the fire risk assessment, this will be considered and implemented.		of the BESS during operation. The BMS monitors temperature continuously and alarms are activated as soon as any concern is observed.
Construction	Plan training exercises with local FRS. ERP to be in place for construction activities.	Labels and signage will be installed clearly showing dangerous, electrical equipment/areas and evacuation locations. All equipment will be stored in a secure storage area, that complies with Original Equipment Manufacturer (OEM) guidelines. Site is secured with suitable fencing to prevent unauthorised access. All personnel will have suitable training and certifications to ensure the BESS is installed and commissioned correctly.	All selected equipment will have necessary certifications and factory acceptance testing reports will be reviewed prior to shipping of equipment. BESS will be transported as per international transportation standards. BESS will be commissioned as per the BESS suppliers standard operating procedures, local and international codes and standards to ensure it is installed correctly and safe to operate. Where necessary, a construction stage fire risk assessment will be carried out to validate the design and determine the final O&M strategy. BESS will be installed based on the design, in alignment with planning and as per the discussions with local FRS.	The construction will ensure that all access roads are constructed to ensure ease of access and safe operation and maintenance of the BESS. An operation and maintenance strategy is finalised before moving to the operations phase.

Project stage	Fire Department	Location/Layout	Equipment	Operation and maintenance
Operation	Operation and management strategy and ERP to be kept up to date and tested regularly. Detailed drawings, battery, fire detection and fire suppression system specifications will be stored on site for easy access by FRS personnel.	All H&S labels and signage are maintained. Information Box for FRS at all site access points.	The BESS are contained in containers that are accessed from the outside. No maintenance personnel will have to enter the containers. The containers will comprise a three level BMS that will monitor cell, module and rack level data. This ensures that quick and effective remedial action can be taken automatically if an issue is identified at each level of the BESS. The BMS monitors temperature continuously and alarms are activated as soon as any concern is observed. Any equipment that has failed or is at risk will be analysed and replaced with equipment of relevant standards and certification.	Operation and maintenance of the BESS will be carried out by certified personnel. Operation and maintenance will be carried out as per OEM guidelines and the operation and maintenance strategy.

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