FIRSTWAY ENERGY

Net Zero Thirty Two Limited

Outline Energy Storage Safety Management Plan

North Cray Road - Energy Storage System

April 2025

Contents

Introduction

1. This Outline Energy Storage Safety Management Plan (OESMP) has been prepared by Firstway Energy (on behalf of Net Zero Thirty Two Limited) to support the planning application for the *construction and operation of a proposed Energy Storage System (ESS) and associated infrastructure* (hereafter referred to as the Proposed Development) on land at North Cray Road, Sidcup, DA14 5HE (the Site).

2. The purpose of this OESMP is to identify the relevant legislation and guidance, ensure it is understood and to demonstrate that the location and design of the Proposed Development is acceptable.

3. It is anticipated that any planning permission for the Proposed Development would include a suitably worded planning condition relating to the submission of a Detailed Energy Storage Safety Management Plan prior to the commencement of operation, which will be prepared to reflect the specific energy storage technology and infrastructure to be installed at the Site.

4. The Detailed Energy Storage Safety Management Plan will be agreed with the London Fire Brigade, as part of the planning condition process.

The Proposed Development

5. The Proposed Development comprises the following:
   - Up to 200no. containerised energy storage units, arranged in rows;
   - Up to 25no. Twin Skid TX units which would be situated next to Inverter Unts (total of 50no. Inverter units);
   - 50no. Interface cabinets;
   - 2no. Customer Switchgear Container units;
   - 1no. Storage container;
   - 2.no welfare units;
   - 2no. water tanks;
   - Fire hydrants;
   - Substation Compound with associated equipment and District Network Operator Control Room structure;
   - Access track to extend from existing access point;
   - Secondary emergency access tracks into each compound;
   - Compound area to be demarcated by perimeter fence line/acoustic fencing;
   - Pole mounted CCTV cameras; and
   - Landscape planting and drainage infrastructure.

Structure of the Report

6. This OESMP includes the following sections:
   - Introduction;
   - Battery Types and Arrangements;
   - Legislation, Standards and Guidance;
   - National Fire Chiefs Council Guidance;
   - Consultation with the London Fire Brigade;
   - Detailed Energy Storage System Safety Management Plan: and
   - Emergency Response Plan.

Energy Storage Types and Arrangements

Energy Storage Types

7. There are a number of different energy storage types than can be used within an Energy Storage System (ESS). A selection of energy storage types is provided below (list is not exhaustive):
    - Lithium-ion;
    - Flow batteries (such as vanadium batteries);
    - Sodium-ion; and
    - Solid-state.

The energy storage type that will be deployed as part of the Proposed Development will be lithium-ion. Lithium-ion is used in a number of day-to-day products including mobile phones and electric cars, and lithium-ion ESS are currently the dominant energy storage system within the UK.

Energy Storage Unit Arrangements

8. Each ESS unit comprises three core elements:
    - Lithium-ion cell: which stores the energy.
    - Lithium module: a module which houses a number of lithium-ion cells connected to one another. Each module has its own isolator which enables it to be switched off to protect the surrounding modules if a fault is identified. The modules are constructed of fire retardant materials.
    - Lithium cell rack: a lithium cell rack consists of a number of battery modules (e.g. 10) which are stacked in a rack system. The rack systems are constructed and enclosed in fire retardant materials.

Legislation, Standards and Guidance

9. The following Standards and Guidance will apply to the Proposed Development and will be adhered to during the detailed design, construction, operation and decommissioning of the Site (the following lists are not exhaustive).

Legislation

10. The following legislation is considered applicable to the Proposed Development:
    - Regulatory Reform (Fire Safety) Order 2005;
    - Health and Safety at Work etc. Act 1974;
    - Management of Health and Safety at Work Regulations 1999 Regulation 3;
    - Electricity Safety, Quality and Continuity Regulations 2002;
    - The Workplace (Health, Safety and Welfare) Regulations 1992;
    - Regulatory Reform (Fire Safety) Order 2005 for the fire safety management in buildings compliance;
    - Construction, Design Management Regulations 2015 (CDM).

Building Regulations

11. The following Buildings Regulations will apply to the Proposed Development:
    - Building Regulations BS 9999 ‘Fire safety in the design, management and use of building, Code of Practice.

Safety Standards

12. The following safety standards will apply to the Proposed Development:

Category	British Standard	Description
Fire Detection and Alarm	BS EN 54 Fire detection and fire alarm system.	This standard includes a number of parts (31) with regard to fire detection and the implementation of fire alarm systems.
	BS 5839-1 Fire Detection and Fire Alarm Systems for Buildings – Part 1: Code of Practice for Design, Installation, Commissioning and Maintenance of Systems in Non-Domestic Premises.	This is a fire safety standard on best practices for fire alarm systems for buildings. It provides recommendations for the planning, design, installation, commissioning and maintenance of fire detection and fire alarm systems in and around non-domestic premises.
	BS 6266 Fire protection for electronic equipment installations. Code of practice.	This standard sets out guidance on how to detect and extinguish fires in the vicinity of electronic equipment installations, taking account of the potential for extensive damage and serious business interruption.
	BS EN 60079-29-3 Part 29-3. Gas detectors. Guidance on functional safety of fixed gas detection systems.	This standard sets out guidance for the design and implementation of a fixed gas detection system, including associated and/or peripheral gas detection equipment, for the detection of flammable gases/vapours and oxygen when used in a safety-related application in accordance with IEC 61508 and IEC 61511.
Automatic Protection	BS 5306-0 Fire protection installations and equipment on premises. Guide for selection, use and application of fixed firefighting systems and other types of fire equipment.	This standard gives guidance on the selection, use and application of automatic water sprinkler, water spray, water mist, gaseous, foam, condensed aerosol, wet chemical and powder fire-fighting systems and hypoxic air fire-prevention systems. It gives guidance on installed equipment for fire and rescue service use, and on the application of portable fire extinguishers. The standard also contains requirements and test procedures with pass/fail criteria, so that component performance can be objectively assessed by a recognised test facility and result in certification.
	BS EN 12845 Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance.	This standard sets out requirements and gives recommendations for the design, installation, and maintenance of fixed fire sprinkler systems in buildings and industrial plants, and particular requirements for sprinkler systems that

		are integral to measures for the protection of life.
	BS EN 14972-1 :2020 Fixed firefighting systems. Water mist systems. Design, installation, inspection and maintenance.	This standard specifies the requirements and gives recommendations for the design, installation, inspection and maintenance of all types of fixed land-based water mist systems.
Transport	BS EN IEC 62281 (2019) Safety of primary and secondary lithium cells and batteries during transport.	This sets out the test methods and requirements for primary and secondary (rechargeable) lithium cells and batteries to ensure their safety during transport other than for recycling or disposal.
Energy Storage Systems	BS EN IEC 62933-1 Electrical energy storage part 1: Vocabulary.	Sets out the terminology applicable to grid-connected systems that are able to extract electrical energy from an electric power system, store it internally and inject electrical power to an electric power system.
	BS EN IEC 62933-2-1:2018 Electrical energy storage (EES) systems - Unit parameters and testing methods. General specification.	This sets out unit parameters and testing methods of electrical energy storage systems.
	BS EN IEC 62933-5-2 Electrical energy storage (EES) systems - Part 5-2: Safety requirements for grid-integrated EES systems - Electrochemical-based systems.	This sets out safety aspects for people and, where appropriate, safety matters related to the surroundings for grid-connected energy storage systems where an electrochemical storage subsystem is used.
Product Safety General	BS EN 62619 :2022 Secondary cells and batteries containing alkaline or other non-acid electrolytes. Safety requirements for secondary lithium cells and batteries, for use in industrial applications.	This standard specifies requirements and tests for the safe operation of secondary lithium cells and batteries used in industrial applications, including stationary applications.
Product Safety Inverters	BS EN 62109-1 Safety of power converters for use in photovoltaic power systems General requirements.	This standard defines the minimum requirements for the design and manufacture of power conversion equipment for protection against electric shock, energy, fire, mechanical and other hazards.
	BS EN 62477-1 Safety requirements for power electronic converter systems and equipment - Part 1: General.	This document: establishes a common terminology for safety aspects relating to power electronic converter systems (PECS), establishes minimum requirements for the coordination of safety aspects of interrelated parts within a PECS, establishes a common basis for minimum safety requirements for the PECS portion of products that contain PECS and specifies requirements to reduce risks of fire, electric shock, thermal,

		energy and mechanical hazards, during use and operation and, where specifically stated, during service and maintenance and specifies minimum requirements to reduce risks with respect to PECS designed as pluggable and permanently connected equipment, whether it consists of a system of interconnected units or independent units, subject to installing, operating and maintaining the PECS in the manner prescribed by the manufacturer.
	BS EN IEC 62368-1 Audio/video, information and communication technology equipment - Safety requirements.	This standard classifies energy sources, prescribes safeguards against those energy sources, and provides guidance on the application of, and requirements for, those safeguards.
Product Safety EMC	BS EN IEC 61000-6-1 Electromagnetic compatibility (EMC). Generic standards. Immunity for residential, commercial and light-industrial environments.	This standard sets out generic standards where apparatus are intended to be directly connected to a low-voltage public mains network or connected to a dedicated DC source which is intended to interface between the apparatus and the low-voltage public mains network. This standard applies also to apparatus which is battery operated or is powered by a non-public, but non-industrial, low voltage power distribution system if this apparatus is intended to be used in the locations described below.
	BS EN 61000-6-3 Electromagnetic compatibility (EMC) - Generic standards. Emission standard for equipment in residential environments.	This standard sets out details of emission requirements for electrical and electronic equipment intended for use at residential locations in order to ensure that radio reception is adequately protected.
Electrical Installation	BS 7671 Requirements for electrical installations. Institute of Engineering and Technology (IET) wiring regulations.	This standard sets out important national standards and provides authoritative requirements to help ensure electrical installations are safe and comply with UK law. BS 7671:2018+A2:2022 introduces a new requirement for Arc Fault Detection Devices (AFDDs), updated requirements for the fire safety design for buildings and a new chapter on prosumer low voltage electrical installations.

Guidance

13. The following Guidance is applicable to the Proposed Development. Note some of the guidance below is from the United States of America and although not explicitly applicable to UK development it nonetheless provides valuable guidance in relation to Energy Storage Systems.

Category	Document	Description
Firefighting	National Guidance Document on the Provision of Water for Firefighting (Water UK & Local Government Association, 2007)	The purpose of the document is to facilitate and promote liaison between Local Authority Fire and Rescue Services and Water Companies in England and Wales.
Product Safety	Recommendations for the storage, handling and use of batteries (RC61) (Fire Protection Association, 2014)	This document provides practical guidance to insurers and their clients on fire hazards and appropriate control measures associated with the selection, storage, charging and use of batteries in commercial and industrial premises.
Energy Storage Systems	Health and Safety Guidance for Grid Scale Electrical Energy Storage Systems (Department for Energy Security and Net Zero, 2024)	The guidance has been prepared to identify existing legislation, regulations, standards and other industry guidance to aid ESS developers navigate the health and safety landscape and to ensure all the relevant elements of health and safety are integrated into each ESS.
	Grid Scale Battery Energy Storage System Planning – Guidance for FRS (National Fire Chief Council, 2022) and Draft Grid Scale Energy Storage System Planning Guidance (National Fire Chiefs Council Guidance, 2024)	The guidance has been prepared to support developers with regard to ensuring the energy storage systems are designed appropriately to minimise risks to the public and the Fire and Rescue Service, in the unlikely event of a fire.
	Battery storage guidance note 1: Battery storage planning (Energy Institute, 2019)	This document provides guidance covering various aspects of planning an energy storage facility. It provides an overview of battery types, planning regulations in the UK, and information on safety issues that should be considered during planning and risk assessments.
	Battery storage guidance note 2: Battery energy storage system fire planning and response (Energy Institute, 2020)	This document provides guidance on how to respond to ESS fires and provides an overview of the fire risk of common battery chemistries, including lithium-ion.
	Code of Practice for Electrical Energy Storage Systems (Institute of Engineering and Technology, 2017)	This Code of Practice looks at electrical energy storage systems and provides information for practitioners to specify safely and effectively, design, install, commission, operate and maintain a system.
	Good Practice Guide on Electrical Energy Storage (UK Energy Storage Operators' Forum, 2014)	The guide aims to disseminate the lessons learnt from electrical energy storage deployments in the UK, including the Customer-Led Network Revolution (CLNR) project and be a reference guide for those implementing electrical energy storage in the UK.
	McMicken Battery Energy Storage System Event Technical Analysis and Recommendations (DNV GL, 2020)	The report sets out technical advice and analysis regarding the investigation into a thermal event and explosion that occurred at an American energy storage facility.

	Considerations for ESS Fire Safety (DNV GL, 2017)	The report summarises the main findings and recommendations from extensive fire and extinguisher testing that evaluated a broad range of battery chemistries.
	Recommended Practice: Safety, Operation and Performance of Grid-connected Energy Storage Systems (DNV GL, 2017)	This document provides recommendations for grid-connected energy storage systems.
	NFPA 855 Standard for the Installation of Stationary Energy Storage Systems (NFPA, 2023)	This document provides guidance with regards to mitigating risks and ensuring all installations perform as designed, taking into account safety considerations. The document offers comprehensive criteria for the fire protection of energy storage system installations based on the technology used, the setting where the technology is being installed, the size and separation of energy storage system installations, and the fire suppression and control systems in place.
	Battery Energy Storage Systems (BESS) Using Li-Ion Batteries (Allianz Risk Consulting, 2019)	This document sets out recommendations to reduce the potential risks in the unlikely event of a fire.
	UL 9540 Standard for Energy Storage Systems and Equipment	This is a safety standard document for energy storage systems.
	UL 1642 Standard for Lithium Batteries	This is a certification for rechargeable lithium-ion batteries for use as a power supply.
	UL 9540A Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems	This standard sets out how energy storage systems should be tested with regard to thermal runaway.
	UL 1973 Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications	This standard sets our requirements for batteries for use as energy storage for stationary applications such as solar, or wind turbine storage.
Transport	Transport of Dangerous Goods (United Nations, 2015)	This document sets out recommendations with regard to the transportation of lithium metal and lithium-ion batteries.
	European Agreement concerning the International Carriage of Dangerous Goods by Road (United Nations Economic Commission for Europe, 2019)	This includes mandatory rules for the transportation of dangerous goods, including lithium cells. The UK is a signatory to this agreement.
	Moving Dangerous Goods (Department for Transport, 2012)	The guidance sets out a plethora of information on how dangerous good should be transport securely.

National Fire Chiefs Council Guidance

14. The National Fire Chiefs Council issued 'Grid Scale Battery Energy Storage System Planning – Guidance for Fire and Rescue Services in November 2022 and Planning Practice Guidance (PPG)

advises that applicants are encouraged to consider the guidance set out within the document when preparing a planning application (PPG Paragraph: 034 Reference ID: 5-034-20230814).

15. The National Fire Chiefs Council undertook a public consultation exercise on their draft 'Grid Scale Energy Storage System Planning Guidance'. The consultation closed on 22nd August 2024. As this draft guidance shows the direction of travel the National Fire Chiefs Council is moving in, the Proposed Development layout has been designed in accordance with the draft guidance.

16. The Proposed Development has taken into account the design related guidance set out in the aforementioned documents and a Fire Strategy Plan has been prepared for submission with the application for Planning Permission, which sets out key embedded design principles.

Embedded Design Principles

17. Key embedded design principles include the following:
    - The ESS units are configured into 4x unit clusters. All ESS units are a minimum of 0.9m away from each unit, in accordance with NFPA 855 as the energy storage units to be installed will comply with UL9540A. Between, each cluster there is a separation distance of 3m.
    - Access tracks are proposed next to each energy storage unit cluster at a minimum to enable fire service vehicles to manoeuvre around the clusters, in the unlikely event of a fire.
    - All ESS units are located a minimum of 10m away from existing and proposed vegetation.
    - Two water tanks are proposed for the London Fire Brigade to access in the unlikely event of a fire. Fire hydrants are also proposed across the site in accordance with approved document Part B Fire Safety.
    - Secondary access/exit points for emergency vehicles are proposed to provide multiple routes to enter/exit the ESS compounds.
    - All internal access routes have been tracked for use by fire service vehicles.
    - There are no buildings within close proximity of the site, as such, the proposed development complies with the requirement to be a minimum of 30m away from the nearest building offsite.

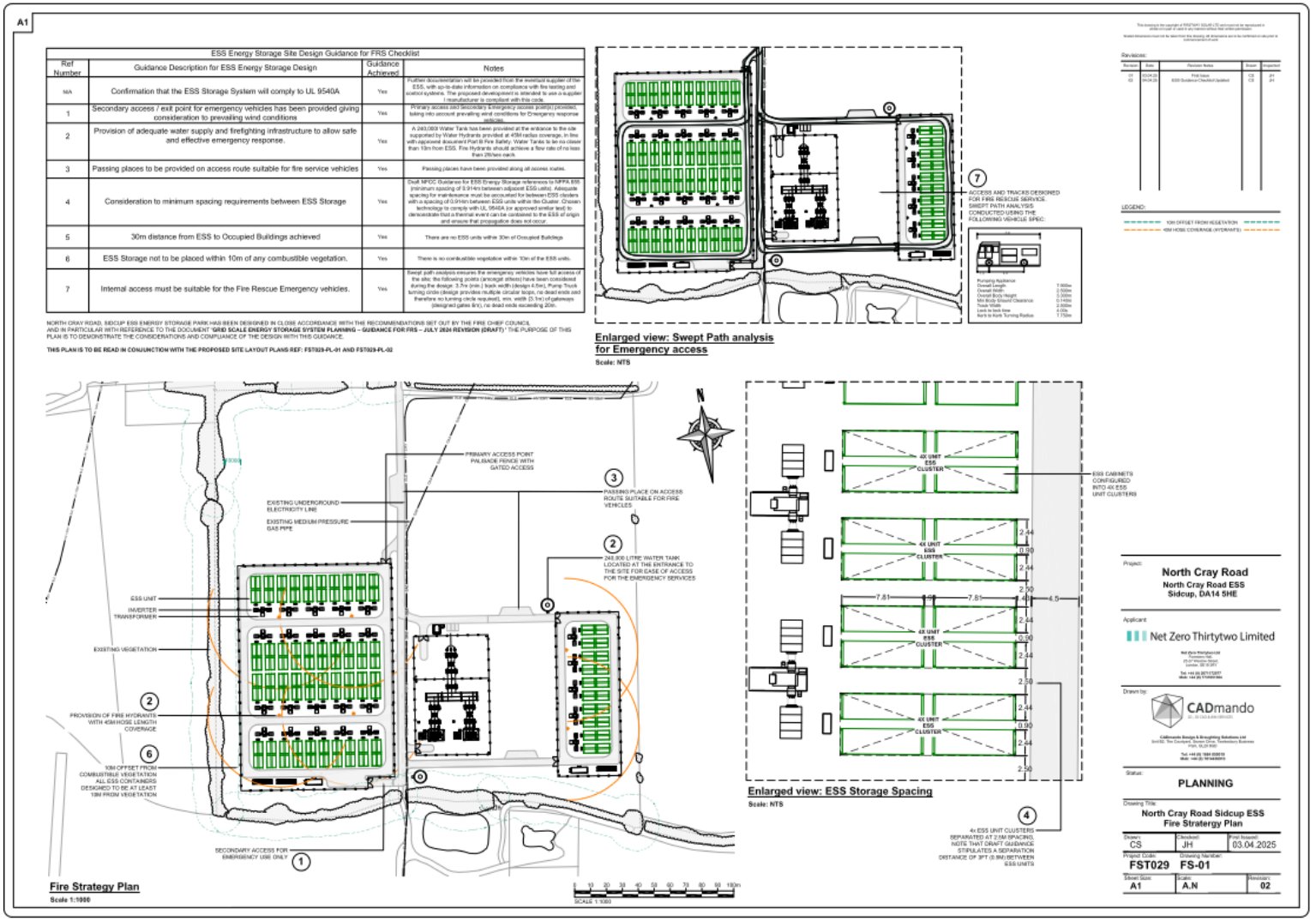

Figure 1 Fire Strategy Plan

Additional Safety Measures

18. In addition to the design principles embedded within the layout of the Proposed Development, the following measures will be included within the chosen infrastructure:
    - The use of fire-resistant enclosures, materials and panels;
    - The use of deflagration panels/vents on each unit to enable venting and prevent explosion;
    - The installation of fire and smoke detection systems within each ESS unit;
    - The installation of automatic dry agent/aerosol fire suppression systems within each ESS unit; and
    - The use of ventilation systems within each ESS unit.

19. These systems will have the facility to be operated remotely or onsite through the ESS Management System. The primary function of the Management System is to monitor key information related to the ESS units to ensure that they remain within normal operating thresholds. This includes monitoring information such as voltage and temperature. Where data appears to be outside of the normal operating thresholds this will be flagged for monitoring by the remote operator through audible and visual alarms. As required, systems such as ventilation can be adjusted remotely to bring key information back into normal operating thresholds. Ultimately, if necessary, an individual energy storage module, rack, unit or the entire site can be shut down remotely to ensure the safety of the site and surrounding area.

Consultation with the London Fire Brigade

20. The London Fire Brigade was contacted on the 5th March 2025 to initiate pre-application discussions regarding the proposed development. A response was not received prior to the submission of the application.

Detailed Energy Storage System Safety Management Plan

21. This Outline Energy Storage Safety Management Plan sets out the initial design and principles that will be embedded within the Proposed Development with the information known at the planning application stage. It is envisaged that a Detailed Energy Storage Safety Management Plan will be secured by planning condition which will be submitted to Bexley Council and the London Fire Brigade for approval, prior to the operation of the development.

22. The Detailed Energy Storage Safety Management Plan will comprise the following:
    - Detailed layout drawing of the final Energy Storage System and confirmation of how the design complies with the National Fire Chief Council's guidance.
    - Confirmation of:
        - Energy storage specification;
        - Fire detection system specification;
        - Fire suppression system specification; and
        - Ventilation system specification.
    - Full details of the operating procedures for the Energy Storage System.
    - Full details of the emergency operating procedures for the Energy Storage System.
    - Confirmation of compliance with the relevant legislation and guidance.
    - An environmental risk assessment in the unlikely event of a fire, e.g. to include impacts on, but not limited to, ecology, water quality, air quality etc.
    - Inclusion of any other information requested by the London Fire Brigade.

Emergency Response Plan

23. An Emergency Response Plan will be prepared prior to the operation of the development to demonstrate a full understanding of the risks associated with the development and how emergencies will be dealt with at the site. This includes setting out protocols for dealing with emergencies, including how and when the London Fire Brigade will be made aware of an emergency. Key contact details relating to the proposed development and the London Fire Brigade will be confirmed to ensure all the relevant parties know the roles of personnel and who to contact in the event of an emergency.