



Outline Fire Risk Safety Statement

Wymondley Battery Energy Storage System

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Basis of Report

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Acronyms and Abbreviations

BSMP	Battery Safety Management Plan
BESS	Battery Energy Storage System
BMS	Battery Management System
EA	Environment Agency
ERP	Emergency Response Plan
EMS	Energy Management System
FACP	Fire Alarm Control Panel
FRS	Fire Rescue Service
HSE	Health and Safety Executive
JESIP	Joint Emergency Service Interoperability Programme Principles
LFL	Lower Flammable Limit
MV	Medium Voltage
NFCC	National Fire Chiefs Council
NFPA	National Fire Protection Agency
OHL	Overhead Lines
PLC	Programmable Logic Controller
SCADA	Supervisory Control and Data Acquisition
SSRI	Site Specific Risk Information
SOC	State of Charge
SOH	State of Health
UKPN	United Kingdom Power Networks
UL	Underwriters Laboratories



1.0 Introduction

This Outline Battery Safety Management Plan (BSMP) provides North Hertfordshire District Council with the relevant battery safety information to support the full application for the construction and operation of the Wymondley Battery Energy Storage System (BESS) project. The information contained in this document has been provided and reviewed by Pivoted Power LLP (a wholly owned subsidiary of EDF Energy Renewables Ltd) (“the Applicant”).

BESS development takes place within a framework of legislative requirements, safety regulations and guidance beyond planning considerations. These are detailed in Section 2.3 of this document. The planning considerations are outlined in the August 2023 Guidance – Renewable and Low Carbon Energy¹. Paragraph 35 of the Planning Guidance states:

“What can applicants seeking planning permission for battery energy storage systems do to ensure they consider any potential risks?”

Where planning permission is being sought for development of battery energy storage systems of 1 MWh or over, and excluding where battery energy storage systems are associated with a residential dwelling, applicants are encouraged to engage with the relevant local fire and rescue service before submitting an application to the local planning authority. This is so matters relating to the siting and location of battery energy storage systems, in particular in the event of an incident, prevention of the impact of thermal runaway, and emergency services access can be considered before an application is made. Applicants are also encouraged to consider guidance produced by the National Fire Chiefs Council when preparing the application.

The location of such sites are of particular interest to fire and rescue services; who will seek to obtain details of the design, and firefighting access and facilities at these sites in their register of site specific risks that they maintain for the purposes of Section 7 of the Fire and Rescue Services Act 2004.”

In summary, the relevant matters an Applicant should consider and submit to the relevant local fire and rescue (FRS) include:

- The Site and Location of BESS.
- Management during the event of an incident.
- Measures to prevent the impact of thermal runaway.
- Emergency services access.
- Other matters covered by the National Fire Chiefs Council guidance²:
 - System design
 - Detection and monitoring
 - Suppression systems
 - Deflagration prevention and venting

¹ Ministry of Housing, Communities and Local Government (2018 to 2021) and Department for Levelling Up, Housing and Communities August 2023. Guidance Renewable and Low Carbon Energy. Available at: <https://www.gov.uk/guidance/renewable-and-low-carbon-energy> [accessed 05/03/2025].

² National Fire Chiefs Council (NFCC) November 2022. Grid Scale Battery Energy Storage System planning – Guidance for FRS. Available at: <https://nfcc.org.uk/wp-content/uploads/2023/10/Grid-Scale-Battery-Energy-Storage-System-planning-Guidance-for-FRS.pdf> [accessed 05/03/2025].



- Access
- Distance from BESS units to occupied buildings and site boundaries
- Site conditions
- Water supplies
- Emergency Plans
- Environmental impacts
- Recovery

Following the Introduction in Section 1 of the Outline BSMP, the remainder of the report is set out in the following sections:

- Section 2 – Background, risk identification, design objectives and guidance.
- Section 3 – Planning application BESS design approach, including siting and location, BESS safety systems, provision for dealing with an emergency and the design response to relevant guidance.
- Section 4 – A record of consultation with Hertfordshire Fire and Rescue Services (Herts FRS).

2.0 Risk Identification and Design Objectives

2.1 Risk identification

All forms of energy generation and electrical installation carry a level of risk of equipment failure. In respect of a BESS, thermal runaway poses the most significant potential hazard and associated risk of damage to health and property. If left uncontrolled, thermal runaway can result in a fire. The main objective of this Outline BSMP is to set out the measures that have been incorporated in the design of the BESS to mitigate the fire risk and to address an emergency incident in the unlikely event of its occurrence.

2.2 Design objectives

The BESS design addresses the following objectives:

- 1 Minimise the likelihood of a fire event.
- 2 Facilitate early detection and intervention.
- 3 Minimise the consequence of a fire event should one occur.
- 4 Ensure the safety of any personnel onsite and in surrounding areas.
- 5 Ensure that firefighters can operate and fight fire in reasonable safety.

2.3 Relevant guidance

In developing the Wymondley BESS, the Applicant has considered the following relevant legislation and industry standards:

- National Fire Protection Agency (NFPA) 855 Standard for the Installation of Stationary Energy Storage Systems 2023.
- Underwriters Laboratories (UL) 9540A Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems.



- United Kingdom Power Networks (UKPN) Engineering Design Standard 07-0116: Fire Energy Storage Systems, 2016.

The following guidance is also relevant:

- **The National Fire Chiefs Council (NFCC) Grid Scale Battery Storage System Planning – Guidance for FRS (November 2023)**, including the following documents referenced in that guidance:
 - State of Victoria (County Fire Authority) (2022), Design Guidelines and Model Requirements: Renewable Energy Facilities.
 - NFPA (2023) Standard for the Installation of Stationary Energy Storage Systems.
 - FM Global 2017 Property Loss Prevention Data Sheets: Electrical Energy Storage Systems Data Sheet 5-33 (see also interim revision July 2023).
 - The Energy Institute: Battery Storage Guidance Note 1 - Battery Storage Planning August 2019.
 - The Fire Industry Association: Guidance Note on Li Ion Battery Fires 2020.
 - DNV GL-Recommended Practice-0043: Safety, Operation and Performance of Grid Connected Energy Storage Systems 2017.

As outlined in Section 1, current government guidance on requirements for planning applications highlights the importance of consulting with the relevant local fire authority and considering the NFCC guidance. Consequently, this Outline BSMP focuses on these key matters.

During 2024 the NFCC published '*Draft Guidance on Grid Scale Battery Energy Storage Systems (BESS)*' to seek views from fire and rescue services. The final revised version of the BESS guidance is expected to be published in later in 2025. In the meantime, the November 2023 version of the BESS guidance remains current.

3.0 Wymondley BESS Design Approach

3.1 Siting and location of the BESS

The proposed BESS site is situated east of the Wymondley National Grid Substation, with the nearest residential property located approximately 160 metres away. The positioning of the BESS enclosures within the site adheres to the NFPA requirement of 3 metres spacing between battery units. The battery units are positioned at least 10 metres away from overhead lines (OHL) that cross the site, and from existing vegetation, in accordance with NGCC guidelines. Access tracks have been designed to ensure unimpeded road access to and from the site. According to local data sources³, the prevailing wind at this site is south-westerly, which is suitable for the access design, coming from the south.

3.2 Prevention of the impact of thermal runaway

Batteries in general present a fire risk due to the combustibility of the materials and the possibility for heat generation due to short circuit potential and chemical reactions. If such energy is released uncontrollably, it could provide the conditions necessary for ignition and

³ https://www.windfinder.com/forecast/luton_airport



fire. In addition to the batteries themselves, BESS present a fire risk similar to other electrical utility equipment.

There are four main ways in which a lithium-ion cell can fail:

- 1 Thermal
- 2 Electrical
- 3 Mechanical
- 4 Chemical

The causes of failure could include issues such as manufacturing defects, overcharging, over-discharging, mechanical damage, overheating or abuse, and short circuits, whether internal or external.

Regardless of the type of failure or the cause, the main potential hazard is thermal runaway, which can ultimately lead to a fire if not controlled. Therefore, this report focuses on reducing fire risk associated with the BESS and managing the hazard in the unlikely event that it occurs. Other electrical systems within the BESS, such as transformers, inverters, and switchgear, can also carry fire risks. However, due to the extensive historic long-term deployment of these technologies, these risks are better understood and regulated through longstanding industry guidance and codes. Therefore, this report addresses only the battery component of the BESS.

To prevent cell failure, various conditions are continuously monitored and managed by the Battery Management System (BMS) and Energy Management System (EMS). The BMS plays a crucial role in identifying any failed cells and promptly disconnecting them, thereby reducing the risk of a minor cell failure escalating into a more serious issue. This proactive approach ensures the overall safety and reliability of the battery system.

Table 1 below outlines the various conditions monitored and managed by the BMS and Energy Management System EMS to prevent battery failure.

Table 1: Key Conditions Monitored and Managed by BMS and EMS to Ensure Battery Safety.

Conditions Leading to Battery Failure	BMS and EMS Response
Overcharging/ Overvoltage	The separators used in lithium-ion cells have limited dielectric capabilities. Overcharging or exceeding voltage limits can damage the separator layer, leading to a short-circuited cell. The BMS/EMS monitors and controls charging to ensure voltage limits are never exceeded. Charging is performed conservatively as the battery approaches full charge to avoid stressing the separator.
Over-Discharging	Discharging at very low State of Charge (SOC) values can result in overcurrent and/or dendrite formation in the separator, which over time can lead to a short-circuited cell. The BMS/EMS monitors and controls discharging to ensure overcurrent limits are not exceeded.
Overtemperature	The compounds in the cell's cathode begin to react with the electrolyte at approximately 90°C. This exothermic reaction can lead to cell failure. The BMS monitors the temperature at the cell surface level and at various points to ensure proper awareness. The BMS halts battery operation once the temperature reaches approximately 55°C during operation.
Under Temperature	Charging a battery cell at low temperatures can damage the separator due to plating. The BMS regulates the rate of charge over specific low-temperature bands to mitigate this potential failure mode.



Conditions Leading to Battery Failure	BMS and EMS Response
Imbalance	It is crucial for all cells within a module and string to be balanced from an SOC and State of Health (SOH) perspective to ensure electrical stresses during operation are imposed symmetrically and without hot spots or stress points. The BMS constantly measures these parameters and ensures proper cell balancing during resting periods to harmonise SOC and SOH.

3.3 Emergency Response to an Incident

The principal contractor will prepare an Emergency Management Plan (EMP) before construction begins, detailing incident response and emergency procedures. After construction, an Emergency Response Plan (ERP) will be drafted to identify hazards, provide key service contacts, and establish a command, control, and communication structure to minimise event impact.

The ERP will align with UK civil response procedures, utilising the bronze (operational), silver (tactical), and gold (strategic) command structures. It will incorporate Joint Emergency Service Interoperability Programme Principles (JESIP) and comply with HMG Emergency Preparedness guidance, Health and Safety Executive (HSE), and Environment Agency (EA) standards for emergency response.

3.4 Other NFCC Guidance Requirements

3.4.1 Information requirements

Before the BESS begins operation, site-specific risk information (SSRI) and an ERP will be developed in consultation with Herts FRS. This information is not a planning requirement and will not be included in the Outline BSMP for safety and security reasons.

3.4.2 System design

The relevant NFCC information requirements relating to system design, construction, testing and decommissioning are set out in Table 2.

Table 2: Relevant NFCC information requirements relating to system design, construction, testing and decommissioning.

NFCC Information Requirements	Planning Application Details
The battery chemistries being proposed (e.g. Lithium-ion Phosphate (LFP), Lithium Nickel Manganese Cobalt Oxide (NMC)).	Lithium-Iron-Phosphate
The battery form factor (e.g. cylindrical, pouch, prismatic)	Prismatic
Type of BESS e.g. container or cabinet	Container
Number of BESS containers/cabinets	28
How the BESS units will be laid out relative to one another.	The BESS Units are grouped together to form an enclosure arranged in a 'Y' structure, consisting of two BESS Containers and one Medium Voltage (MV) Skid. Each MV Skid contains two separate pieces of equipment: a



NFCC Information Requirements		Planning Application Details
		transformer and a power conversion system.
A diagram / plan of the Site		See the Site Layout Plan, planning drawing reference WYM-EDFR-BESS-CIV-PLN-300-06.
Evidence that Site geography has been taken into account (e.g., prevailing wind conditions).		The prevailing winds are south-westerly, making it unlikely that access from the south would be impeded in the event of an incident. The proposed water tank is strategically located immediately west of the BESS compound access gates at the top of the access track.. The layout is designed to accommodate the site's natural topography, with the proposed drainage feature positioned at the lowest point.
Access to, and within, the Site for FRS assets ⁴		The access track is 4 metres wide, allowing FRS vehicles to easily enter the BESS compound. The site layout has been carefully designed to ensure there is sufficient space at the end of the access track for a fire engine to safely turn around without entering the BESS compound itself.
Details of any fire-resisting design features		The BESS arrangement is designed to minimise the risk of fire propagation. Each enclosure features a 1-hour fire-rated wall for back-to-back BESS Units. A 3.3 m separation distance is maintained between each 'Y'-shaped BESS enclosure, and a 6m fire break is provided in the centre of the compound to further reduce the risk of fire propagation.
Details of any:		
a.	Fire suppression systems	Aerosol – the enclosures are equipped with thermally activated aerosol canisters. When the temperature reaches a certain threshold, the canisters release a suppression compound into the enclosure. Each canister stores an amount of aerosol

⁴ The FM Global document referenced in the NFCC guidance on "access between BESS units and unit spacing" was updated in July 2023. Therefore, the standard minimum spacing mentioned should be considered according to the updated FM Global data sheet.



NFCC Information Requirements		Planning Application Details
		that is double the volume of air within the enclosure.
b.	On Site water supplies (e.g. hydrants, EWS etc)	A water tank will be situated at the end of the access track, adjacent to the BESS compound, ensuring easy access for emergency services entering the site. The tank will have a capacity of 223m ³ .
c.	Smoke or fire detection systems (including how these are communicated)	Each BESS container is equipped with a photoelectric smoke detector, networked to a Fire Alarm Control Panel (FACP). This panel is connected to the BMS/EMS and can be monitored remotely. Each row features a UL-listed or EN 54-compliant FACP, with one smoke detector per enclosure networked to this panel. The row-level FACP can be networked with other panels and/or monitored remotely.
d.	Gas and/or specific electrolyte vapour detection systems	Each enclosure contains CO and H ₂ sensors. The CO sensor detects at 300 ppm, while the H ₂ sensor detects at 5% of the Lower Flammable Limit (LFL). The Programmable Logic Controller (PLC) for each row aggregates information from each enclosure and transmits it to the Supervisory Control and Data Acquisition (SCADA) network. The alarms and warnings include temperature, humidity, H ₂ , and CO. If triggered, the SCADA system will immediately contact Herts FRS.
e.	Temperature management systems	As previously mentioned, each enclosure is equipped with a temperature sensor that communicates with the SCADA system.
f.	Ventilation systems	The ventilation system in the containers is activated by the H ₂ sensor. Given the free air volume of 3.9 cubic metres, the analysis requires 96.3 air changes per hour. This results in an air flow rate of 376 cubic metres per hour. In testing, the BESS system has the capability to ventilate up to 480 cubic metres per hour.
g.	Exhaust systems	
h.	Deflagration venting systems	The BESS enclosure is liquid-cooled, inherently mitigating the risk of



NFCC Information Requirements		Planning Application Details
		deflagration since the enclosure is not an airtight space, unlike air-cooled systems. However, the enclosure is equipped with a roof-mounted deflagration panel that redirects the forces created by an explosion upwards.
Identification of any surrounding communities, sites, and infrastructure that may be impacted as a result of an incident.		OHLs bisect the site. There is a minimum distance of 13 m between the OHLs and the BESS containers and at least 5m from the MVS

3.4.3 Environmental Impacts

The environmental impacts of the BESS are dealt with in the suite of documents provided in the planning application submission.

3.5 Decommissioning Strategy

The decommissioning of a BESS site presents similar health and safety risks to its commissioning, due to changes in the site's operation and potential removal of safeguards.

At the end of the operational life of the Wymondley BESS, a Decommissioning Plan will be prepared to ensure that the site will be reinstated to its original form. Decommissioning of the project usually involves a series of planned actions to safely dismantle the installation, manage waste, and restore the site. This Decommissioning Plan will be drafted by the Applicant's asset management team which will be submitted to North Hertfordshire District Council. Following points will be addressed:

- **Regulatory Compliance:** The decommissioning process will be ensured to comply with all relevant local and national regulations, including environmental and safety standards (e.g., the Waste Batteries and Accumulators Regulations 2009; and the Waste Electrical and Electronic Equipment Regulations 2013).
- **Decommissioning Plan:** A detailed decommission strategy will be drafted to outline the steps, including site restoration and environment protection. Before doing any work, relevant ecological and technical surveys will be done to ensure the site has been reinstated to an appropriate standard.
- **Health and Safety:** Strict health and safety protocols will be implemented to protect workers and the public during the decommissioning process, particularly when handling hazardous materials.
- **Environmental Considerations:** Assessments are done to mitigate any environmental impacts, including soil contamination and the proper disposal or recycling of non-hazardous and hazardous materials.
- **Waste Management and Recycling:** Procedures will be established for the disposal of non-recyclable materials and the recycling of components such as metal casings and electrical equipment. A Battery Recycling Plan will also be established with partnership of the BESS suppliers.
- **Battery Disassembly:** The batteries will be safely discharged and stabilised before disassembly to prevent fires or chemical spills. Follow manufacturer



guidelines and industry best practices for the handling and neutralisation of battery cells.

- **Post-Decommissioning Monitoring:** The developer will conduct environmental monitoring, if necessary, to ensure the site does not pose any long-term environmental or health risks.

4.0 Hertfordshire Fire & Rescue Service (Herts FRS) Consultation

Consultation with the Herts FRS has been ongoing, involving both email correspondence and a virtual meeting held on 29 January 2025. During this virtual meeting, the Applicant shared extensive experience and knowledge with Herts FRS regarding Battery Energy Storage System (BESS) sites, battery safety, and fire management. This exchange included a detailed discussion of the preliminary site design, highlighting key safety features and operational protocols.

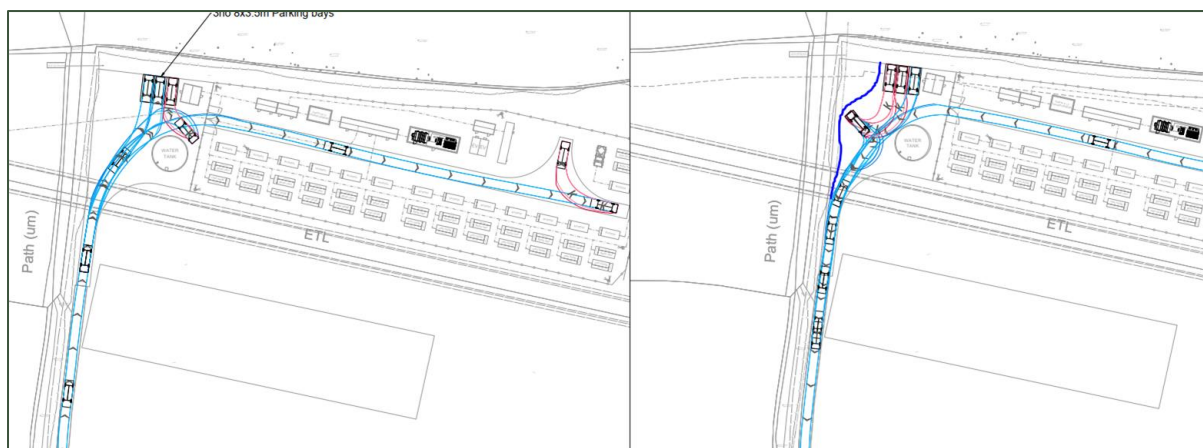
The discussion was productive, with Herts FRS providing valuable feedback and insights. The Applicant outlined its comprehensive approach to battery safety, emphasising the importance of robust fire management strategies and the integration of advanced safety technologies. The preliminary site design was reviewed, and specific safety measures were discussed in detail.

Following the meeting, several key action points were identified for the Applicant:

- **Submit a BSMP where decommissioning strategy will be mentioned:** The Applicant was tasked with preparing and submitting an Outline BSMP as part of the planning application. This plan to include safety protocols, emergency response procedures, and risk mitigation strategies related to the BESS site. As well as including relevant equipment specific information. This document fulfills this requirement.
- **Provide information regarding gas monitoring:** The Applicant was requested to include information on gas monitoring within the BSMP. This would involve specifying the types of gases monitored, the detection methods used, and the response protocols in place for any detected anomalies. The requested information is provided in Table 2 above.
- **Provision of hardstanding/parking area outside the fence line:** The Applicant was tasked with ensuring that a hardstanding area is provided outside of the fence line to enable an adequate Staging Area (where people, vehicles, and equipment gather in preparation for assignment in the event of an incident). Basic swept path analysis was undertaken to confirm that at least three fire engines could park and turn outside the fence line. The plan below addresses this requirement.



Figure 1: Basic Swept Path Analysis Demonstrating Adequate Space for Staging Area.



Since the meeting, Herts FRS has not raised any concerns regarding the development. The Applicant has addressed the information requests through the provision of this document, which includes comprehensive details on gas monitoring as set out in Table 2. This proactive approach has ensured that all safety considerations are thoroughly documented and communicated, fostering a collaborative relationship with Herts FRS and ensuring the highest standards of safety for the BESS site.



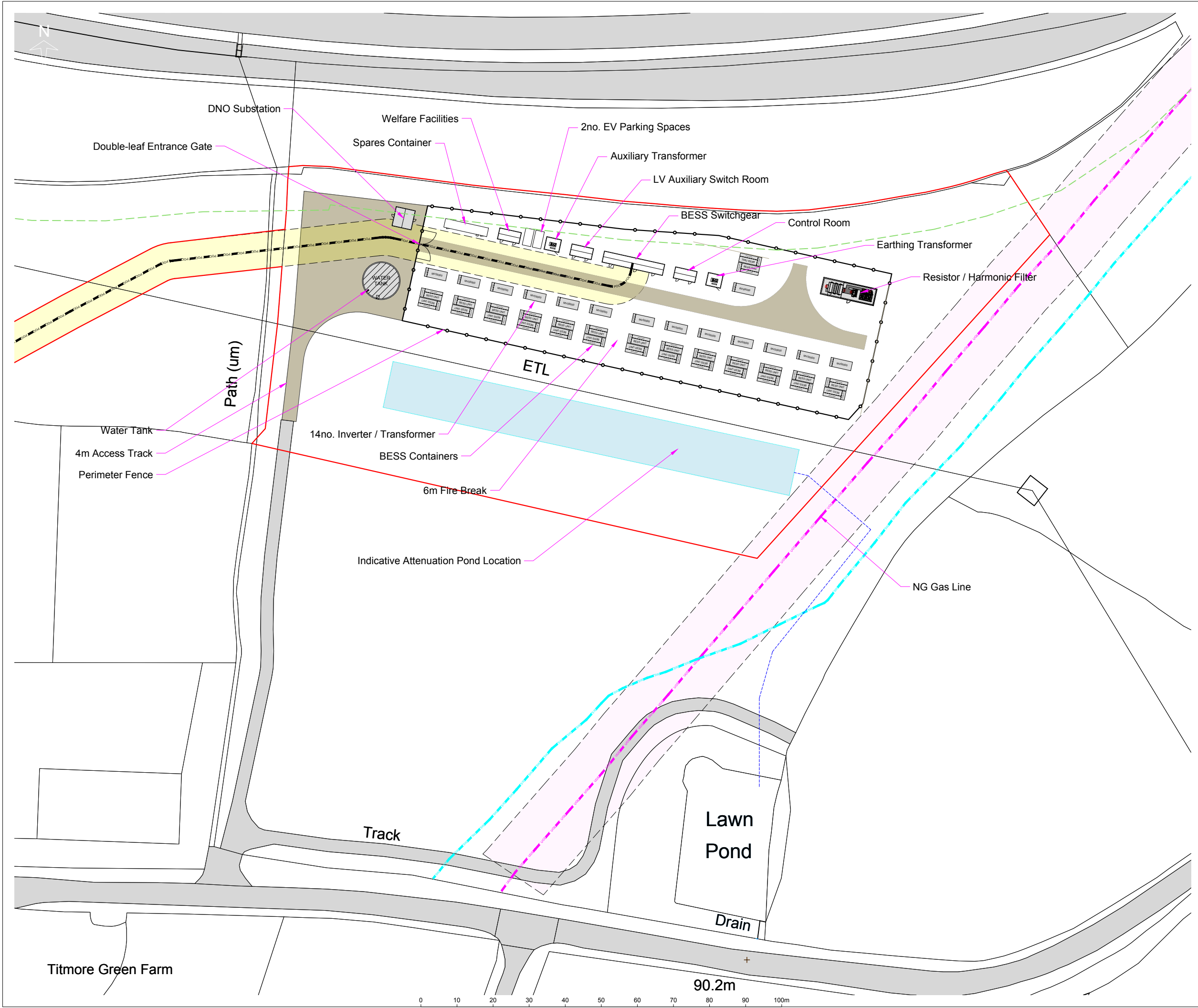
5.0 Summary

This Outline BSMP details the design approach for the Wymondley BESS and specifies the information requested by Herts FRS prior to planning submission. This Outline BSMP ensures that the Wymondley BESS will be constructed and operated safely.

The Outline BSMP is intended to evolve over time, contributing to the more detailed Emergency Management Plan (EMP), which will be finalised before construction begins. The EMP will detail incident response and emergency procedures. Additionally, the Outline BSMP will inform the Emergency Response Plan (ERP) after construction. Both the EMP and ERP will be circulated to Herts FRS for its comments and feedback.



**Appendix A Site Layout Plan
Circulated with Herts
FRS**



NOTES

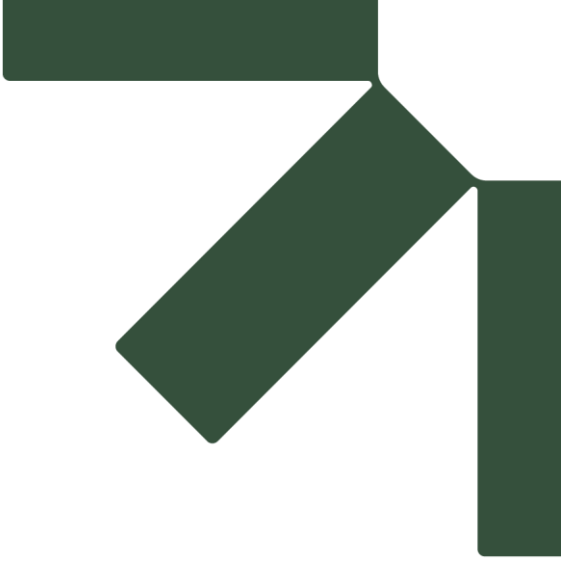
1. All details are indicative only.

LEGEND

- PLANNING APPLICATION BOUNDARY
- PERIMETER FENCE
- UNDERGROUND POC CABLE ROUTE
- CONSTRUCTION COMPOUND
- EXISTING UG WATER PIPE
- NG GAS EASEMENT (10M)
- WOODLAND BUFFER (10M)
- PROPOSED ATTENUATION PIPE

01.	Initial Issue	30.01.25	SRY
Rev	Description	Date	Checked
Drawing No.			
WYM-EDFR-BESS-CIV-PLN-300-00			
Project			
Wymondley BESS			
Title			
Site Layout Plan			
Scale	1:1000 @A3	Drawn by	Checked
		JL	-
		Date	30.01.25





Appendix B Swept Path Analysis – Staging Area



 www.slrconsulting.com				Client EDF				Notes: 1. This is not a construction drawing and is intended for illustrative purposes only. 2. White lining is indicative only.										Legend:																																																	
Drawing Status & Suitability Code				Project Wymondley BESS & ISS																																																															
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