Green Hill Solar Farm

EN010170

Concept Design Parameters and Principles

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DCO Submission

Concept Design Parameters and Principles

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1 Introduction

1.1 Purpose of the Document

1.1.1 This Concept Design Parameters and Principles document supports an application for a Development Consent Order (DCO) for the construction, operation and maintenance and decommissioning of Green Hill Solar Farm (hereafter referred to as the 'Scheme') with a total capacity exceeding 50 megawatts (MW). The Scheme consists of an electricity generating station with a capacity of approximately 500 MW comprising of ground mounted Solar Arrays and associated development, the latter encompassing: energy storage, grid connection infrastructure and any other infrastructure as well as works integral to the construction, operation, maintenance and decommissioning of the Scheme.

1.1.2 The Applicant is Green Hill Solar Farm Limited, part of Island Green Power. The Scheme is located within the administrative areas of North Northamptonshire Council, West Northamptonshire Council and Milton Keynes City Council.

1.1.3 This document sets out the design parameters and principles by which the Scheme has been designed and the Environmental Impact Assessment has been undertaken. It will be secured by a Requirement in Schedule 2 to the draft DCO in order to prescribe the guiding design principles and parameters to inform the detailed design of the Scheme post DCO consent.

1.1.4 This document should be read alongside Chapter 4 of the Environmental Statement (ES) Scheme Description **[EN010170/APP/GH6.2.4]** and the Design Approach Document **[EN010170/APP/GH7.16]**

1.1.5 The spatial extent of the Scheme is referred to as the 'Order Limits' and is shown on the Works Plans accompanying the DCO application **[EN010170/APP/GH2.4]** which are secured by Article 3 of the Draft DCO **[EN010170/APP/GH3.1]**. The Environmental Impact Assessment (EIA) presented in the Environmental Statement (ES) **[EN010170/APP/GH6.1** to **EN010170/APP/GH6.5]** has been undertaken based on the maximum extents of each of the Work Numbers described in Schedule 1 to the Draft DCO as shown on the Works Plans. This approach is known as the 'Rochdale Envelope' and Planning Inspectorate Advice Note 9 sets out advice on the use of the 'Rochdale Envelope' as a way of assessing a proposed development comprising EIA development where uncertainty exists with the final design details and necessary flexibility is sought. The use of the Rochdale Envelope is further discussed in Chapter 2: EIA Process and Methodology **[EN010170/APP/GH6.2.2]** and Chapter 4: Scheme Description **[EN010170/APP/GH6.2.4]**.

1.1.6 Due to the rapidly evolving technology within the Solar Photovoltaics (PV) and battery energy storage system sectors, the in-built flexibility allows for the most up-to-date technology to be utilised for the development of the Scheme. The full detailed design at the point of construction will be managed post-consent through the Requirements set out in Schedule 2 of the Draft DCO.

1.1.7 This Concept Design Parameters and Principles document defines the key design parameters which reflect the worst-case scenario adopted in the Environmental Impact Assessment that has been undertaken for the Scheme. As

the detailed design of the Scheme will be in accordance with these assessed parameters, the conclusions of the ES will be upheld.

1.1.8 The Concept Design Parameters and Principles have been set out in **Tables 1 to 9** and organised in accordance with the description of the Works Numbers as set out in Schedule 1 to the Draft DCO **[EN010170/APP/GH3.1]**. The spatial extents of each Work Number are set out in the accompanying Works Plans **[EN010170/APP/GH2.4]**. Where required, this document will refer to other submitted DCO application documentation that will be secured by a Requirement in the Draft DCO (such as the Outline Construction Environmental Management Plan [**EN010170/APP/GH7.1**] or Outline Landscape and Ecological Mitigation Plan [**EN010170/APP/GH7.4**]). Where applicable, these outline management plans will set out further details of the design, parameters and mitigation measures that will be complied with as part of the construction, operation, maintenance and decommissioning of the Scheme.

1.1.9 For each scheme component outlined in **Tables 1 to 9**, the parameter has been defined by its:

- Location – the location of the Scheme component within the Scheme as assessed within the ES;
- Scale – either a minimum or maximum parameter which has been assessed in the ES; and
- Design – relevant design parameter or principle which has been assessed in the ES.

1.1.10 All heights defined in **Tables 1 to 9** are Above Ground Level (AGL), unless otherwise specified.

1.2 Design Principles

1.2.1 The Scheme has been designed with consideration to the following design principles:

- The design of the Scheme will be landscape led exploring the intrinsic character and beauty of the surrounding countryside.
- Adherence to the mitigation hierarchy to reduce impacts and control any adverse effects on the environment throughout the lifecycle of the project from construction through to operation and maintenance and decommissioning.
- The Scheme will deliver a minimum 10% net gain for biodiversity through strategic habitat creation and enhancement measures.
- The Scheme's design will retain a degree of flexibility to enable it to adapt over time, be functional and fit for purpose, and respond to innovative and new technologies as well as building resilience to climate change.
- The Scheme will be carefully designed to minimise where practicable impacts on amenity from air quality, traffic and noise effects and safeguard the health and safety of local residents by securing suitable control

measures during construction, operation and maintenance and decommissioning of the Scheme.

- The design of the Scheme will be sensitive to above and below ground heritage assets and their setting, by locating infrastructure at a suitable distance and through appropriate landscape screening.
- The Scheme will be sensitive to existing land uses where practicable and maximise opportunities to strengthen green and blue infrastructure.
- The Scheme will seek to minimise the effects of the development on Public Rights of Way (PRoW) by incorporating measures to maintain, and where practicable, explore opportunities to improve the local PRoW network.

2 Design Parameter and Principles Tables

2.1 Work No. 1 Concept Design Parameters and Principles

2.1.1 The extent of works defined by Work No. 1 is set out in Schedule 1 of the draft Development Consent Order **[EN010170/APP/GH3.1].**

2.1.2 **Work No. 1**—

Work No. 1A—a ground mounted solar photovoltaic generating station with a gross electrical output capacity of over 50 megawatts including—

a. solar modules fitted to mounting structures;

b. DC electrical cabling and combiner DC boxes;

c. conversion units including inverters, transformers, switchgear, and monitoring and control systems; and

d. electrical and communications cabling connecting Work No. 1(c) to Work No. 3A, and Work No. 3B and Work No. 3C.

Table 1: Work No. 1 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No. 1 area	Location	Work No. 1A must be located within the corresponding numbered area shown on the Works Plans.
	Design Parameters	Work No. 1, excluding Work No.1A (d), will be offset from the following features by these minimum distances: • Ditches– 8m, or 9m where within Milton Keynes City Council and West Northamptonshire area • IDB watercourses – 9m • All hedgerows – 15m • Woodland – 20m • Individual trees and groups of trees – 10m (unless Arboriculture survey indicate a larger Root Protection Area requirement) • Public rights of way: 15m from PROW centreline • Residential curtilage: 50m
Solar PV Modules and Mounting Structures (Work No. 1A (a))	Scale: Tracker Panels	Height parameters • Maximum height at greatest inclination: 4.5m.

Scheme Component	Parameter Type	Design Parameters and Principles
		• Maximum height at horizontal alignment: 2.5m. • Minimum height/clearance from ground at greatest inclination: 0.4m.
	Scale: Fixed Panels	Height parameters • Maximum height of modules: 3.5m. • Minimum height/clearance from ground: 0.4m. Electrical infrastructure associated with the panels will be elevated by the mounting structures so that it is no less than 0.6 m above the 0.1% Annual Exceedance Probability (AEP) flood level or where this is not possible as high as practicable).
	Scale: Tracker Panels	Lateral separation parameters; • Minimum separation between modules: 2.5m • Maximum distance between module centrelines: 15m
	Scale: Mounting Structures	Maximum depth of piled mounting structures will be 4m below ground level.
	Design Parameter: Tracker Panels	The tracking solar modules will be aligned in north south rows, and incline to the east or west up to a maximum inclination of 60 degrees from horizontal.
	Design Parameter: Fixed Panels	The fixed solar modules will be aligned in east-west rows, and slope towards the south at a fixed slope of 15 to 35 degrees from horizontal.
	Design Principle	The solar modules are likely to be either black or dark blue. This will be fixed during detailed design.
	Design Principle	The frame type is likely to be anodized aluminium alloy or a similar finish.
	Design Principle	The panel technology will be bifacial monocrystalline panels.
	Design Principle	Modules will be mounted on a rack likely to be made with galvanised steel or similar design material.
	Design Principle	Foundations will typically be galvanised steel poles driven into the ground. These

Scheme Component	Parameter Type	Design Parameters and Principles
		will either be piles rammed into a pre-drilled hole or a pillar attaching to a steel ground screw. Foundations in areas of archaeological interest and areas of high UXO risk may constitute concrete feet to which the mounting structures will be affixed. In such circumstances, concrete feet will be set directly on the topsoil with no excavation.
DC electrical boxes (Work No. 1A (b))	Scale	• Maximum width 0.55 m • Maximum length 0.65 m • Maximum height 0.26 m
	Design Principle	Where a DC box is required, it would sit on a mounting structure.
Conversion units (including inverters, transformers, switchgear, and monitoring and control system incorporated within a container (Work No. 1A(c))	Quantity	• Maximum of 1 conversion unit per 2.5 MW of peak solar energy generation.
	Scale	• Maximum length 15.0 m • Maximum width 6.5 m • Maximum height 3.5 m
	Design Principle	Conversion units will sit in containers, externally finished to be in keeping with the prevailing surrounding environment. The exact colour will be subject to manufacturer specifications and agreed with the relevant planning authority prior to construction but will be as similar as feasibly possible to a light grey (RAL 7004) colour finish.
	Design Principle	Monitoring and control systems would consist of manual controls at the conversion units, and automatic and centralised monitoring and control features at the control rooms on the onsite substations.
	Design Principle	A concrete foundation slab, strips or footings for each of the conversion units and a levelling layer of aggregate with a maximum depth of 0.8 m will be required, or a concrete plinth set atop the topsoil where non-ground-penetrative works are required

Scheme Component	Parameter Type	Design Parameters and Principles
Standalone inverters, transformers, switchgear, and monitoring and control system		
Standalone inverters, transformers, switchgear, and monitoring and control equipment	Design Principle	A concrete foundation slab, strips or footings for each of the standalone units, and a levelling layer of aggregate with a maximum depth of 0.8 m will be required, or a concrete plinth set atop the topsoil where non-ground-penetrative works are required.
	Design Parameter	Critical infrastructure is to be located within Flood Zone 1. Where this is not feasible, the conversion units will be raised 0.6 m above the 0.1% AEP + CC flood level or where this is not possible as high as practicably possible.
Inverters	Scale	The maximum parameters of an inverter will be 9.0 m in length by 6.5 m in width and 3.5 m in height, sited within the dimensions of the conversion unit.
	Design Principle	Externally finished to be in keeping with the prevailing surrounding environment. The exact colour will be subject to manufacturer specifications and agreed with the relevant planning authority prior to construction but will be as similar as feasibly possible to light grey (RAL 7035) colour finish.
Transformers	Scale	The maximum parameters of a transformer will be 5.5 m in length by 6.5 m in width and 3.5 m in height, sited within the dimensions of the conversion unit.
	Design Principle	Externally finished to be in keeping with the prevailing surrounding environment. The exact colour will be subject to manufacturer specifications and agreed with the relevant planning authority prior to construction but will be as similar as feasibly possible to light grey (RAL 7035) colour finish.
Switchgear	Scale	The maximum parameters of a switchgear will be 6.5 m in length by 2.5 m in width and 3.5 m in height, sited within the dimensions of the conversion unit. One switchgear will be located at each inverter location.
	Design Principle	Externally finished to be in keeping with the prevailing surrounding environment. The exact colour will be subject to manufacturer

Scheme Component	Parameter Type	Design Parameters and Principles
		specifications and agreed with the relevant planning authority prior to construction but will be as similar as feasibly possible to light grey (RAL 7035) colour finish.
DC electrical cabling (Work No. 1A(b))	Scale	Cabling from and between solar modules, to inverters and transformers: • Minimum depth of trenches: 0.4 m • Maximum width of trenches: 3.5 m Suspended cable height: • Minimum height from ground: 0.4 m • Maximum height from ground: 2.4 m
	Design Principle	Cabling will be above ground level between the solar modules. These will be fixed to the mounting structure along the row of racks. Cabling between the solar modules and conversion units will be buried within underground trenches, or a trenchless technique will be used, or cables will be suspended where non-ground-penetrative works are required.
AC electrical cabling and communications (Work No. 1A(d))	Scale	Cabling from and between solar modules, to inverters and transformers: • Minimum depth of trenches: 0.4 m • Maximum width of trenches: 3.5 m Suspended cable height: • Minimum height from ground: 0.4 m • Maximum height from ground: 2.4 m
	Design Principle	Cabling between the conversion units and onsite substation will be buried within underground trenches, or a trenchless technique will be used, or cables will be suspended where non-ground-penetrative works are required.
Temporary horizontal directional drilling pits if trenchless technique used for Work No. 1A(b) or (d)	Scale	Maximum dimensions of 25 m by 25 m in plan, with onsite equipment and structures being of a maximum of 6 m in height.
	Design Principle	Groundcover will consist of hardcore aggregate, or track matting, with soil protection measures, dependent on the

Scheme Component	Parameter Type	Design Parameters and Principles
		result of geophysical surveys to establish ground bearing capacity.

2.2 Work No. 2 Concept Design Parameters and Principles

2.2.1 The extent of works defined by Work No. 2 is set out in Schedule 1 of the draft Development Consent Order **[EN010170/APP/GH3.1].**

Work No. 2— an energy storage facility comprising —

a) battery energy storage cells with automatic fire suppression system or dry pipe sprinkler system;

b) a structure protecting the battery energy storage cells comprised in Work No. 2(a) and ancillary equipment, being either one container or multiple containers joined to each other, mounted on a reinforced concrete foundation slab or concrete piling;

c) interconnection units including heating, ventilation and air conditioning or liquid cooling systems and temperature management either housed within the containers comprised in Work No. 2(b), attached to the side or top of each of the containers, or located separate from but near to each of the containers;

d) conversion units including inverters, transformers, switchgear and energy management system;

e) monitoring and control systems housed within a container with Work No. 2(c) or located separately in its own container or control room;

f) electrical cabling including electrical cables connecting Work No. 2 to Work No. 3A;

g) bunded impermeable surface to manage surface water drainage;

h) water storage facility for the purposes of firefighting water supply; and

i) bunded impermeable surface and associated infrastructure to contain used firewater.

Table 2: Work No. 2 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No. 2 area	Location	Work No. 2A must be located within the corresponding numbered area shown on the Works Plans.
	Design Principle	The design of energy storage facility will include a number of design elements to both prevent, detect and control a fire should one occur. These include: • The use of batteries that are sealed by design so do not vent when in normal use and have no free electrolyte.

Scheme Component	Parameter Type	Design Parameters and Principles
		• The battery modules will contain cells separated by a thermal barrier or an air gap to prevent one cell affecting the temperature of the adjacent one, with the modules themselves also separated from one another by another thermal barrier or an air gap. The thermal barrier or an air gap is intended to ensure that should one cell/module heat up it will not impact on the adjacent cell/module so as to prevent a thermal cascade. • The batteries will be controlled by charging management systems that will detect if a cell or battery is not operating correctly and the whole BESS will be fitted with a fire monitoring system so if one cell or module were to catch fire the fire suppression system will automatically be triggered to slow down the propagation of thermal runaway in the BESS enclosure. • If the BESS system is designed to safely burn out to remove the risk of stranded energy in the battery systems, then this type of BESS system will integrate a dry pipe sprinkler system.
A structure protecting the battery energy storage cells comprised in Work No. 2A(b) and ancillary equipment, being either one container or multiple containers joined to each other, mounted on a reinforced concrete foundation slab or concrete piling (Work No. 2A (b))	Scale	Size parameters for individual BESS enclosure • Maximum length: 24m • Maximum width: 3m • Maximum height: 3.5m
	Design Parameter	Strings of BESS enclosures and interconnector containers will be separated from each other and surrounding infrastructure by a minimum distance that complies with any relevant NFCC or NFPA guidelines at the time of detailed design.
	Design Principle	Externally finished to be in keeping with the prevailing surrounding environment. The exact colour will be subject to

Scheme Component	Parameter Type	Design Parameters and Principles
		manufacturer specifications and agreed with the relevant planning authority prior to construction but will be as similar as feasibly possible to a cream (RAL 9001) colour finish.
	Design Principle	HVAC or liquid cooling systems will be housed either within each of the containers, attached to the side or top of each of the containers, or located separate from but near to each of the containers.
	Design Principle	The foundations for the containers will either be a reinforced concrete base to a maximum depth of 1.0 m, or, if a piling solution is required, piles to a maximum depth of 12.0 m would be used.
Conversion units (Work No. 2A (d)	Scale	Maximum height 3.5 m
	Design Principle	A conversion unit incorporates inverters, transformers, switchgear and energy management systems. These will either be located outside or housed together in a container.
	Design Parameter	The foundations for the conversion units will either be with a concrete foundation slab (to a maximum depth of 1.0 m) for each of the power conversion units and inverters and a levelling layer of gravel with a concrete perimeter pavement when located outside, or on a concrete foundation slab when housed in a container. A piling solution may also be required, for both the indoor and outdoor options, depending on the results of geotechnical surveys. If this is the case, piles to a maximum depth of 12.0 m would be used.
DC electrical cabling (Work No. 2A (f))	Scale	Cabling in trenches: • Minimum depth of trenches: 0.4m • Maximum width of trenches: 3.5m
	Design Principle	Cabling between battery containers and conversion units will be above ground in cable trays or laid in an underground trench.

Scheme Component	Parameter Type	Design Parameters and Principles
AC electrical cabling (Work No. 2A (f))	Scale	Cabling from conversion units and the substation: • Minimum depth of trenches: 0.4m • Maximum width of trenches: 3.5m
	Design Parameter	AC cabling will operate at no more than 33 kV.
	Design Principle	Cabling between the conversion units and onsite substation will be buried within underground trenches, or a trenchless technique will be used.
Temporary horizontal directional drilling pits if trenchless technique used for Work No. 2A(f)	Scale	Maximum dimensions of laydown areas are 25 m by 25 m in plan, with onsite equipment and structures being of a maximum of 6 m in height.
	Design Principle	Groundcover will consist of hardcore aggregate, or track matting, with soil protection measures, dependent on the result of geophysical surveys to establish ground bearing capacity.
Monitoring and control systems housed within a container with Work No. 2A(c) or located separately in its own container or control room (Work No. 2A(e))	Scale	Size parameters for monitoring or control building or container: • Maximum length: 12.5 m • Maximum width: 3.5 m • Maximum height: 3.5 m
	Design Principle	The monitoring and control system will be housed either in an adapted container or built from glass reinforced plastic (GRP).
Fire suppression system Work No. 2A(a)	Design Principle	Any automatic fire suppression system will comply with any applicable NFCC or NFPA guidelines at the time of detailed design.
	Design Principle	Automatic fire suppression systems, if integrated into the design of each container, will be located either within or outside the container. If located outside, the fire suppression agent containers will either be decentralised and located at each container or centralised.
Water storage structures for the purposes of firefighting	Location	The external firefighting water storage structures will be located no less than 10m from the battery containers.

Scheme Component	Parameter Type	Design Parameters and Principles
water supply (Work No. 2(h))	Scale	The external firefighting water storage units will be no less than 230,000 litres in capacity in line with current NFCC guidelines (2023).
	Design Principle	Water storage will either be in sectional steel panel tanks, or cylindrical steel tanks, above or below ground.
	Design Principle	Where above ground, tanks will be supported on structural concrete slab foundations which will be to a maximum depth of 1.0 m.
Used firewater containment structures and infrastructure (Work No. 2(i))	Design Principle	A sump will be integrated into each battery storage container for internal fire suppression.
	Design Principle	The compound will be bunded and linked to a bunded lagoon or geocellular crate storage area which will be provided to capture fire water run off from external fire water.

2.4 Work No. 3 Concept Design Parameters and Principles

2.4.1 The extent of works defined by Work No. 3 is set out in Schedule 1 of the draft Development Consent Order **[EN010170/APP/GH3.1].**

2.4.2 **Work No. 3**— works in connection with onsite substations including—

Work No. 3A— a substation with works comprising—

i. an up to 400 kV substation, with associated transformer bays, feeder bays, transformers, switchgear buildings and ancillary equipment including reactive power units;

ii. control building or container relay rooms with associated offices, storage and welfare facilities;

iii. monitoring and control systems for Work Nos. 1 and 3A;

iv. maintenance compound;

v. electrical cabling; and

vi. earthworks, including soil stripping and site levelling.

Work No. 3B— a substation with works comprising—

i. an up to 132 kV substation, with associated transformer bays, feeder bays, transformers, switchgear buildings and ancillary equipment including reactive power units;

ii. control building or container relay rooms with associated offices, storage and welfare facilities;

iii. monitoring and control systems for Work Nos. 1 and 3B;

iv. maintenance compound;

v. electrical cabling; and

vi. earthworks, including soil stripping and site levelling.

Work No. 3C— a substation with works comprising—

i. an up to 33 kV substation, with associated feeder bays, switchgear and ancillary equipment including reactive power units;

ii. control unit or container relay unit with associated storage;

iii. monitoring and control systems for Work Nos. 1 and 3C;

iv. maintenance compound;

v. electrical cabling; and

vi. earthworks, including soil stripping and site levelling.

Table 3: Work No. 3 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No. 3 area	Location	Work No. 3A – C must be located within the corresponding numbered area shown on the Works Plans.
	Scale	Maximum parameters for the onsite substations are outlined below: Maximum height: • Work 3A – 12.5 m • Work 3B – 6.8m • Work 3C – 3.5m Maximum width: • Work 3C – 3.5m Maximum length: • Work 3C – 12.5m
	Design Principle	The substation area is to be levelled and covered in a layer of levelling gravel.
	Design Parameter	Onsite infrastructure will be mounted on a concrete base or monolith plinth to a maximum depth of 1.0 m. If a piling solution is required, piles to a maximum depth of 12.0 m would be used.
Control buildings or containers (Work No. 3A-C(ii)	Scale	Maximum parameters for control buildings or containers within the substation compound are outlined below: Work 3A: • 400 kV control room: 14m by 26m and height of 3.2m. Work 3B: • 132 kV control room: 5m by 12m and height of 4.5m.
	Design Parameter	Foundations will either be concrete base or plinth to a maximum depth of 1.0 m.
	Design Parameter	Lighting not affixed to a building will be mounted on a lighting column with a maximum height of 3.0m.
	Design Principle	The control buildings will be modular unit design finished in neutral colours to be in keeping with the prevailing surrounding environment. The exact colour will be subject to manufacturer

Scheme Component	Parameter Type	Design Parameters and Principles
		specifications and agreed with the relevant planning authority prior to construction but will be as similar as feasibly possible to a grey such as Goose Grey (HEX code 848889).
AC electrical cabling (Work No. 3A(v), 3B(v) and 3C(v))	Scale	Cable trenching maximum dimensions: • Minimum depth of trenches: 1.2 m • Maximum width of trenches: 3.5 m
	Design Parameter	AC cabling will operate at no more than 400 kV.
	Design Principle	Where underground, cable trenches will be cut with vertical walls.

2.6 Work No. 4 Concept Design Parameters and Principles

2.6.1 The extent of works defined by Work No. 4 is set out in Schedule 1 of the draft Development Consent Order **[EN010170/APP/GH3.1].**

2.6.2 **Work No. 4**— works to the National Grid substation to facilitate connection of the authorised development to the National Grid including population of the substation bay –

a) a 400 kV 3-phase 4000 A circuit breaker for control and protection of the outgoing circuit serving the authorised development;

b) a 3-phase set of current transformers for protection of the new outgoing 400 kV feeder circuit and the overlap with the National Grid system;

c) a 3-phase high accuracy metering current and voltage transformer assembly for commercial metering of the connection;

d) a 3-phase 400 kV line disconnector/earth switch for isolation and earthing of the outgoing 400 kV feeder circuit;

e) a 3-phase set of 400 kV high voltage cable sealing ends and cables connecting the National Grid substation with Work No. 5;

f) a 3-phase power quality ready capacitor voltage transformer; and

g) provision of a stand-alone building to house duplicate feeder protection systems, commercial metering systems, protection and control equipment and user remote control and data acquisition apparatus.

2.6.3 As Work No. 4 consists entirely of works to be undertaken by the National Grid within their substation, no specific design parameters or principles can be determined at this stage.

2.7 Work No. 5 Concept Design Parameters and Principles

2.7.1 The extent of works defined by Work No. 5 is set out in Schedule 1 of the draft Development Consent Order **[EN010170/APP/GH3.1].**

2.7.2 **Work No. 5**— works in connection with electrical cabling including—

2.7.3 **Work No. 5A**— works to lay electrical cables up to 400 kilovolts, accesses, and temporary construction laydown areas for the electrical cables including—

i. high voltage electrical cables connecting Work Nos.3A and 4;

ii. high voltage electrical cables connecting Work No. 3A to Work No. 3A;

iii. laying down of access tracks, ramps, footpaths, roads, including the laying and construction of drainage infrastructure, signage and information boards;

iv. joint bays, link boxes, cable ducts, cable protection, joint protection, manholes, marker posts, underground cable marker, tiles and tape, communications chambers, fibre optic cables and lighting and other works associated with cable laying;

v. tunnelling, boring and drilling works; and

vi. temporary construction and decommissioning laydown areas comprising—

a) areas of hardstanding, compacted ground or track matting;

b) car parking;

c) area to store materials and equipment;

d) site and welfare offices and workshops;

e) security infrastructure, including cameras, perimeter fencing and lighting;

f) safety infrastructure to manage traffic when crossing roads or other obstacles;

g) site drainage and waste management infrastructure (including sewerage); and

h) electricity, water, waste water and telecommunications connections.

2.7.4 **Work No. 5B**— works to lay electrical cables up to 132 kilovolts, accesses, and temporary construction laydown areas for the electrical cables including—

i. high voltage electrical cables up to 132 kilovolts connecting Work Nos.3A and 3B;

ii. high voltage electrical cables up to 33 kilovolts connecting Work Nos.3B and 3C;

iii. laying down of access tracks, ramps, footpaths, roads, including the laying and construction of drainage infrastructure, signage and information boards;

iv. joint bays, link boxes, cable ducts, cable protection, joint protection, manholes, marker posts, underground cable marker, tiles and tape, communications chambers, fibre optic cables and lighting and other works associated with cable laying;

v. tunnelling, boring and drilling works; and

vi. temporary construction and decommissioning laydown areas comprising—

a) areas of hardstanding, compacted ground or track matting;

b) car parking;

c) area to store materials and equipment;

d) site and welfare offices and workshops;

e) security infrastructure, including cameras, perimeter fencing and lighting;

f) safety infrastructure to manage traffic when crossing roads or other obstacles;

g) site drainage and waste management infrastructure (including sewerage); and

h) electricity, water, waste water and telecommunications connections.

Table 4: Work No. 5 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No. 5 area	Location	Work No. 5 must be located within the corresponding numbered area shown on the Works Plans.
400 kV cable trenches (Work no.5A)	Scale	Maximum parameters of surface-dug trenches within the 30m construction working area for the cable corridor: • Maximum trench width: 1.4m (except at joining bays or approach to horizontal directional drilling sections) • Minimum trench depth where unconstrained: 1.2m • Maximum trench depth below existing buried utilities or apparatus: 2m below existing apparatus

Scheme Component	Parameter Type	Design Parameters and Principles
	Design Principle	Electrical cables will be set in ducts or directly buried arranged in parallel formation.
	Design Principle	Trenches will be cut with vertical walls.
Horizontal directional drilled 400 kV voltage cable sections (Work No. 5A(iv))	Design Principle	Where set in horizontal directional drilling sections, the 3no. cables making up a single electrical cable circuit will be drilled through individual bores.
	Scale	Parameter for HDD bores are set out as follows: • Individual bored tunnels are a maximum diameter of 1.0 m. • Individual bored tunnels are a maximum depth of 25 m below ground level, and a minimum 5.0 m below the surveyed river bed of main rivers. • Individual bores for cables in the same circuit are separated by a minimum of 5.0m from the centre points of the cables.
	Scale	Parameters for HDD landing areas: • Maximum area: 25.0 m × 25.0 m • Maximum height of onsite equipment and structures: 6.0 m
		Maximum parameters of surface-dug trenches for a single 132kV circuit within the 30m construction working area for the cable corridor: • Maximum trench width: 0.5m (except at joining bays or approach to horizontal directional drilling sections) • Minimum trench depth where unconstrained: 1.2m • Maximum trench depth below existing buried utilities or apparatus: 2m below existing apparatus
132 kV cable trenches (Work No.5B)	Scale	Maximum parameters of surface-dug trenches for two parallel circuits within the 30m construction working area for the cable corridor:

Scheme Component	Parameter Type	Design Parameters and Principles
		• Maximum trench width: 1m (except at joining bays or approach to horizontal directional drilling sections) • Minimum trench depth where unconstrained: 1.2m • Maximum trench depth below existing buried utilities or apparatus: 2m below existing apparatus
	Scale	Where multiple circuits are set along parallel paths, the maximum trench width is up to 3.5m (except at joining bays or approach to horizontal directional drilling sections).
	Design Principle	Electrical cables will be direct buried or set in ducts arranged as either a single or two or three parallel circuits, with each circuit set in trefoil formation.
	Design Principle	Trenches will be cut with vertical walls.
Horizontal directional drilled 132 kV voltage cable sections (Work No. 5B(iv))	Design Principle	Where set in horizontal directional drilling sections, the 3no. cables making up a single electrical cable circuit will be drilled through the same bore in trefoil arrangement.
	Scale	Parameter for HDD bores are set out as follows: • Individual bored tunnels are a maximum diameter of 1.0 m • Individual bored tunnels are a maximum depth of 25 m below ground level, and a minimum 5.0 m below the surveyed river bed of main rivers • Individual bores for cables in multiple circuits are separated by a minimum of 3.0 m
	Scale	Parameters for HDD landing areas: • Maximum area: 25.0 m × 25.0 m Maximum height of onsite equipment and structures: 6.0 m
Joint bays (Work No. 5A-B(iv))	Scale	Maximum dimensions:

Scheme Component	Parameter Type	Design Parameters and Principles
		• Maximum length: 20.0 m • Maximum width: 6.0 m • Maximum depth below ground level: 3.0 m Frequency parameters: • Minimum separation distance along cable route: 150 m • Maximum separation distance along cable route: 2,000 m
Fibre communications chambers	Scale	Maximum dimensions: • Maximum length: 1.5 m • Maximum width: 1m • Maximum depth below ground level: 1.5m • Maximum height above ground level: 0.2 m Frequency parameters: • Maximum separation distance along cable route: 2,000 m
	Design Principle	Covers for fibre bays will be black or dark grey or green metal or plastic.

2.8 Work No. 6 Concept Design Parameters and Principles

2.8.1 The extent of works defined by Work No. 6 is set out in Schedule 1 of the draft Development Consent Order **[EN010170/APP/GH3.1].**

2.8.2 **Work No. 6**— works including—

a) fencing, gates, boundary treatment and other means of enclosure;

b) works for the provision of security and monitoring measures including CCTV columns, lighting columns and lighting, cameras, weather stations, communication infrastructure, and perimeter fencing;

c) landscaping and biodiversity mitigation and enhancement measures including planting;

d) improvement, maintenance and use of existing private tracks;

e) laying down of internal access tracks, ramps, means of access and footpaths;

f) temporary footpath diversions, signage and information boards;

g) earthworks;

h) sustainable drainage system ponds, runoff outfalls, general drainage and irrigation infrastructure and improvements or extensions to existing drainage and irrigation systems;

i) acoustic barriers;

j) electricity and telecommunications connections; and

k) secondary temporary construction and decommissioning laydown areas.

Table 5: Work No. 6 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No. 6 area	Location	Work No. 6 must be located within the corresponding numbered area shown on the Works Plans.
Site-wide perimeter fencing	Scale	Maximum parameters of site-wide perimeter fencing: • Maximum height: 2.5 m • Minimum separation from solar PV Mounting Structure : 4m
	Design Principle	Perimeter fencing will consist of deer wire mesh and wooden post fencing.
	Scale	Maximum height of perimeter fencing around Work Nos. 2 and 3: 3m

Scheme Component	Parameter Type	Design Parameters and Principles
Perimeter fencing for Work Nos. 2 and 3	Design Principle	The primary means of enclosure around Work Nos. 2 and 3 will be metal palisade security fencing with integrated gates for access.
Acoustic barriers	Scale	Green Hill BESS site layout includes a 1.5m high bund with a 2.4m high acoustic barrier on top.
	Design Principle	The acoustic barrier will have a minimum surface mass of 12 kg/m2 and be imperforate (i.e. no gaps or holes).
CCTV and site monitoring equipment	Scale	The maximum height of CCTV poles will be 3.0m
	Design Principle	CCTV poles will be galvanised steel and painted green. CCTV cameras will rely on infrared light.
Internal access tracks	Scale	The width of internal access tracks will be: • Minimum width: 3.0 m • Maximum width: 6.0 m
Internal site laydown areas	Scale	Stored onsite equipment and material will be of a maximum of 3.0 m in height

2.10 Work No. 7 Concept Design Parameters and Principles

2.10.1 The extent of works defined by Work No. 7 is set out in Schedule 1 of the draft Development Consent Order **[EN010170/APP/GH3.1].**

2.10.2 **Work No. 7**— temporary construction and decommissioning laydown areas including—

a) areas of hardstanding;

b) car parking;

c) site and welfare offices and workshops;

d) security infrastructure, including cameras, perimeter fencing and lighting;

e) area to store materials and equipment;

f) site drainage and waste management infrastructure (including sewerage); and

g) electricity, water, waste water and telecommunications connections.

Table 6: Work No. 7 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No. 7 area	Location	Work No. 7 must be located within the corresponding numbered area shown on the Works Plans.
Site security equipment	Scale	The maximum height of CCTV poles will be 3.0 m. The maximum height of light poles will be 3.0 m. The maximum height of security fencing will be 2.5 m.
	Design Principle	CCTV poles will be galvanised steel and painted green. CCTV cameras will rely on infrared light.
	Design Principle	Lighting will be directed into laydown areas with shades or cowling to avoid light spill. Lighting will only be used in operational hours of darkness (such as in winter). Security lighting during non-operational hours will be operated by motion-detection.
	Design Principle	The primary means of enclosure will be metal or timber security fencing with hoarding and integrated gates for access.

2.11

2.12 Work No. 8 Concept Design Parameters and Principles

2.12.1 The extent of works defined by Work No. 8 is set out in Schedule 1 of the draft Development Consent Order **[EN010170/APP/GH3.1].**

2.12.2 **Work No. 8**— works to facilitate access to Work Nos. 1 to 7 and 9 to 10 including—

Work No. 8A— works to facilitate temporary construction and decommissioning access to Work Nos. 1 to 7 and 9 to 10 including—

a) creation of accesses from the public highway;

b) creation of visibility splays;

c) works to alter the layout of any street or highway temporarily; and

d) offsite works adjacent to highways land including those to structures, boundary features, drainage features on private land required for the facilitation of movement of abnormal indivisible loads associated with Work Nos. 3 and 5.

Work No. 8B— works to facilitate permanent access to Work Nos. 1 to 6 and 9 to 10 including—

a) creation of accesses from the public highway;

b) creation of visibility splays; and

c) works to alter the layout of any street or highway permanently.

Table 7: Work No. 8 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No. 8 area	Location	Work No. 8A and Work No.8B must be located within the corresponding numbered area shown on the Works Plans.
Site access points and access tracks	Scale	Parameters for access points and access tracks: • Minimum width of construction and decommissioning accesses for two-way movement: 5.0 m • Maximum width of construction and decommissioning accesses for two-way movement: 6.5 m (including passing places) • Minimum width of permanent site access points: 3.5 m • Maximum width of permanent site access points: 6.0 m • Minimum width of permanent internal site access tracks: 3.0 m

Scheme Component	Parameter Type	Design Parameters and Principles
		• Maximum width of permanent internal site access tracks: 6.0 m
	Design Principle	Access tracks will be trackpad covered ground; compacted earth, hardcore, or gravel over a levelling layer of substrate; or metalled surface if pre-existing, subject to ground load-bearing capacity and archaeological features, and utilising of existing accesses.

2.13 Work No. 9 Concept Design Parameters and Principles

2.13.1 The extent of works defined by Work No. 9 is set out in Schedule 1 of the draft Development Consent Order **[EN010170/APP/GH3.1].**

2.13.2 **Work No. 9**— works to create and maintain habitat management areas, including —

a) fencing, gates, boundary treatment and other means of enclosure;

b) signs, interpretation boards or any other information display board;

c) earth works including bunds, embankments, ponds, trenching and swales;

d) landscaping and biodiversity mitigation and enhancement measures including planting;

e) means of access; and

f) drainage.

Table 8: Work No. 9 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No. 9 area	Location	Work No. 9 must be located within the corresponding numbered area shown on the Works Plans.
Perimeter fencing (Work No. 9(a))	Scale	Maximum height of site-wide perimeter fencing: 2.5 m
	Design Principle	Perimeter fencing will consist of deer wire mesh and wooden post fencing.
Site internal access tracks	Scale	Parameters for internal access tracks: • Minimum width of permanent internal site access tracks: 3.0 m • Maximum width of permanent internal site access tracks: 6.0 m
	Design Principle	Access tracks will be compacted earth, hardcore, or gravel over a levelling layer of substrate, subject to ground load-bearing capacity and archaeological features, and utilising of existing accesses.

2.14 Work No. 10 Concept Design Parameters and Principles

2.14.1 The extent of works defined by Work No. 10 is set out in Schedule 1 of the draft Development Consent Order **[EN010170/APP/GH3.1].**

2.14.2 **Work No. 10**— works to create and maintain habitat management areas, including —

a. **Work No. 10A**— creation of permissive paths for the exclusive use of pedestrian users comprising—

i. ramps, bridges and other means of access;

ii. fencing, gates, boundary treatment and other means of enclosure;

iii. signs, interpretation boards or any other information display board; and

iv. landscaping and biodiversity mitigation and enhancement measures including planting.

b. **Work No. 10B**— creation of permissive paths for the exclusive use of pedestrians and equestrian users comprising—

i. ramps, bridges and other means of access;

ii. fencing, gates, boundary treatment and other means of enclosure;

iii. signs, interpretation boards or any other information display board; and

iv. landscaping and biodiversity mitigation and enhancement measures including planting.

Table 9: Work No. 10 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No. 10 area	Location	Work No. 10 must be located within the corresponding numbered area shown on the Works Plans.
Permissive paths (Work No. 10 A-D)	Scale	Parameters for permissive paths: • Minimum usable width for pedestrian access: 2.0 m • Minimum usable width for cyclist and equestrian access: 3.0 m • Maximum usable width of all users: 5.0 m
	Design Principle	Permissive paths will be made from compacted earth planted over with grass.
Perimeter fencing (Work No. 10A-H(ii))	Scale	Maximum height of site-wide perimeter fencing: 2.5 m
	Design Principle	Perimeter fencing will consist of deer wire mesh and wooden post fencing.

Scheme Component	Parameter Type	Design Parameters and Principles
Gates and enclosure (Work No. 10A-H(ii))	Scale	Where permissive paths are gated, or where bollards or posts are used to prevent vehicular access: • Minimum clear width between (gate)posts or bollards of 1.2 m for pedestrian access. • Minimum clear width between (gate)posts or bollards of 1.45 m for cyclist and equestrian access. • Maximum clear width of 1.6 m to prevent vehicular access where bollards or posts used.