Tillbridge Solar

Tillbridge Solar Project

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Chapter 3: Scheme Description

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3. Scheme Description

3.1 Introduction

3.1.1 This chapter provides a description of the Tillbridge Solar Project ('the Scheme'). The physical characteristics of the Scheme are described alongside the proposed programme of works. The key activities that would be undertaken during site preparation, construction, operation (including maintenance) and decommissioning works are included in this chapter to inform each of the technical assessments included in **Chapters 6** to **18** of this ES **[EN010142/APP/6.1]**.

3.1.2 The Scheme is defined as a Nationally Significant Infrastructure Project (NSIP), as it consists of the construction of an onshore generating station in England exceeding 50 megawatts (MW) and therefore is designated an NSIP under sections 14(1)(a) and 15(2) of the Planning Act (PA) 2008. Associated development and other ancillary works are also proposed as part of the Scheme and are subject to the application for development consent for the Scheme ('the Application'). The NSIP and associated development are described in this chapter and defined in Schedule 1 of the **draft Development Consent Order (DCO**) **[EN010142/APP/3.1]** and explained in the **Explanatory Memorandum to the draft DCO [EN010142/APP/3.2]**.

3.1.3 This chapter is supported by the following figures **[EN010142/APP/6.3]**:

a. **Figure 3-1: Indicative Principal Site Layout Plan**;
b. **Figure 3-2: Indicative BESS Station and Solar Station Layout**;
c. **Figure 3-3: Indicative BESS Station and Solar Station Elevation**;
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p. **Figure 3-14: Indicative Construction Compound Layout**.

3.1.4 Due to a number of solar DCO projects in the region (Gate Burton Energy Park [EN010131], West Burton Solar Project [EN010132] and Cottam Solar

Farm [EN010133]), the Applicant has investigated the potential for a shared Cable Route Corridor with these schemes. However, this chapter describes the construction, operation and decommissioning of the Scheme, including the Cable Route Corridor, in isolation from the nearby solar DCO projects.

3.1.5 For further information on the cumulative assessment of the Scheme, including the shared Cable Route Corridor, in conjunction with the nearby solar DCO projects, see **Chapter 18: Cumulative Effects and Interactions** of this ES **[EN010142/APP/6.1]**) and the **Joint Report on the Interrelationship with other National Infrastructure projects [EN010142/APP/7.6]**.

3.1.6 This chapter has been updated to take into account changes made to the Scheme as part of the Change Application, submitted in September 2024. At Deadline 3, this chapter has been updated in response to comments received from the Canal and River Trust. The document references have not been updated from the original submission. For the most up-to-date documents, the reader should access these through the **Guide to the Application [EN010142/APP/1.2 (Rev05)]** and Schedule 13 of the **Draft DCO [EN010142/APP/3.1(Rev04)]**.

3.2 Rochdale Envelope

3.2.1 The Scheme will comprise the construction, operation (including maintenance) and decommissioning of ground-mounted solar photovoltaic (PV) panel arrays and associated infrastructure to generate electricity. The Scheme will export and import electricity to the National Electricity Transmission System (NETS). The associated development includes but is not limited to access provision, a Battery Energy Storage System (BESS), underground cabling between the different areas of solar PV, and areas of landscaping and biodiversity enhancement, as outlined in Schedule 1 of the **draft DCO [EN010142/APP/3.1]** and the **Explanatory Memorandum to the draft DCO [EN010142/APP/3.2]**. The Scheme also includes a 400kV underground cable (Cable Route Corridor) of approximately 18.5km length connecting the Principal Site to the NETS at the National Grid Cottam Substation, as well as works to facilitate connection to the National Grid Cottam Substation.

3.2.2 In order to ensure a robust assessment of the likely significant environmental effects of the Scheme, the Environmental Impact Assessment (EIA) has been undertaken adopting the principles of the ‘Rochdale Envelope’ where appropriate, as described in the Planning Inspectorate Advice Note 9 (Ref. 3-1). This involves assessing the maximum (and, where relevant, minimum) parameters for the Scheme where flexibility needs to be retained. Where this approach is applied to the specific aspects of the EIA, this has been confirmed within the relevant chapters of this ES. This approach sets worst-case parameters for the purposes of the assessment but does not constrain the Scheme from being built in a manner that would lead to lower environmental and social impacts. The draft DCO will secure these worst-case parameters via **Works Plans [EN010142/APP/2.3]**, **Streets, Rights of Way and Access Plans [EN010142/APP/2.4]** and the **Outline Design Principles Statement [EN010142/APP/7.4]**, providing certainty that the impacts of the Scheme will be no worse than those assessed as part of the

EIA. The draft DCO has been submitted with the Application to the Secretary of State for Energy Security and Net Zero.

Assessment Years

3.2.3 Indicative timescales for the construction, operation and decommissioning of the Scheme that have been assumed for the purposes of the assessments within this ES are as follows:

a. It is currently anticipated that construction work will commence, at the earliest, in late 2025. The construction phase is anticipated to be a minimum of 24 months and a maximum of 36 months. The peak construction year for the purpose of the EIA is anticipated to be 2026; this assumes commencement of construction in 2025 and that the Scheme is built out rapidly over a 24-month period, with all sites constructed concurrently. A construction period of 24-months is considered to be the likely worst case from an environmental assessment perspective for the majority of the environmental topics because it compresses the potential impacts into a shorter duration and represents the greatest impact on sensitive receptors. A lengthened construction phase would likely result in a lower magnitude of environmental impacts on sensitive receptors. However, where a longer duration of the construction period is deemed to represent a worse effect, this is stated in the relevant technical ES chapters and the assessment presented in those chapters assumes a longer duration (as appropriate).

b. It is currently anticipated that the Scheme will commence commercial operation in 2028. Depending on the final construction programme and commencement of construction, operation may overlap with the construction phase. It is a possibility that, once the grid connection has been constructed and parts of the Scheme have been connected to the National Grid, these areas could begin operation while other parts are still being constructed and connected. The Applicant is seeking a time limited consent with respect to the operation of the Scheme; the operational life of the Scheme will be 60 years, which will start from the date of the final commissioning phase of the Scheme. This ES considers the impact of the operation of the Scheme and of the maintenance and replacement of equipment as outlined in **Table 3-1**.

c. The operational life of the Scheme is to be 60 years and decommissioning is therefore estimated to commence in 2088. Decommissioning is likely to take between 12 and 24 months in phases. There would be two main phases associated with decommissioning, the first phase would remove the above ground structures followed by the removal of below ground elements of the Scheme.

3.2.4 **Table 3-1** presents the indicative design life of Principal Site components. During the operational phase, as components approach its design life, there will be an evaluation to determine if the components require maintenance and/or replacing. It is not anticipated that wholescale maintenance or replacement would be required but rather it would be programmed in stages to maintain the electrical export to the National Grid. The maintenance and replacement of Scheme components is considered within the assessment

scenarios identified above, and a requirement for an annual schedule of proposed maintenance and replacement to be presented to the Local Planning Authorities (LPAs) is included within the **Framework Operational Environmental Management Plan (OEMP) [EN010142/APP/7.9].** The effect of the replacement of Scheme components would be no worse than during the construction phase, in particular the consideration of vehicle movements. However, mitigation measures, if necessary, would be agreed with the LPAs based on the schedule of proposed maintenance and replacement.

Table 3-1: Indicative Design Life of Scheme Components

Scheme Component	Indicative Design Life
Solar Panels	25-40 years
Inverters	10-20 years
Racking and Mounting Systems	15-25 years
Above ground electrical Wiring and Cabling	25-30 years
Transformers	25-30 years
Monitoring and Control Systems	10-20 years
Batteries	5-15 years
DC/DC Converters	10-20 years
Meteorological Sensors	5-15 years
Substation Equipment	25-30 years
Communication Equipment	10-20 years

3.2.5 Construction of the Scheme is detailed in Section 3.5 of this chapter.

3.3 Design Parameters

3.3.1 The design of the Scheme has been developed on the basis of an iterative process, based on environmental assessments and consultation with statutory and non-statutory consultees. **Chapter 4: Alternatives and Design Evolution** of this ES **[EN010142/APP/6.1]** describes this process further, including options that have been considered and discounted or where amendment have been made to the Scheme design. The **Design and Access Statement [EN010142/APP/7.3]** submitted with the DCO Application also explains the design process, rationale and solution.

3.3.2 A number of the design aspects and features of the Scheme cannot be confirmed until the tendering process for the design and construction of the Scheme has been completed. For example, the sizes of buildings or enclosures may vary, depending on the Contractor selected and their specific configuration and selection of plant.

3.3.3 Through use of the Rochdale Envelope approach, a likely worst-case assessment of environmental effects is presented to take into account different parameters of the Scheme that cannot yet be fixed. Wherever an

element of flexibility is maintained, alternatives have been assessed and the likely worst-case impacts have been reported in the ES in technical chapters were relevant.

3.3.4 This ES and the assessments within it are based on the works proposed in the DCO (described principally in Schedule 1 of the **draft DCO [EN010142/APP/3.1]**, the **Works Plans [EN010142/APP/2.3]**, **Streets, Rights of Way and Access Plans [EN010142/APP/2.4],** and the **Outline Design Principles Statement [EN010142/APP/7.4]**). The maximum design parameters and design principles of the works which are relevant to the ES assessments are set out in **Table 3-2** below. Each Scheme component is described in more detail in Section 3.4.

3.3.5 **Table 3-2** is not intended to be an exhaustive description of the works presented in Schedule 1 of the **draft DCO [EN010142/APP/3.1]**. Works that are minor or ancillary in nature are discussed elsewhere in this chapter and in other DCO application documents, where necessary. In addition, the technical chapters within this ES contain a section, setting out the relevant design parameters relevant to the particular assessment that are likely to result in the worst-case effects.

Table 3-2: Indicative details of the design parameters used for the ES assessment.

Scheme Component	Parameter Type	Applicable Design Principle
The Principal Site	Developable Area	The total area for the solar PV panels, associated infrastructure and mitigation is 1,345ha.
Work No. 1— a ground mounted solar photovoltaic generating station with a gross electrical output capacity of over 50 megawatts including— (a) solar panels fitted to mounting structures		
Solar PV panels Work No 1(a)	Dimensions	Individual panels are typically between a minimum of 2m and a maximum of 2.5m in length and a minimum of 1m and a maximum of 1.4m in width.
	Scale	The maximum total land area occupied by the Solar PV panels within the Principal Site will be up to 739.56 hectares (ha).
	Panel colour	Typically, black or dark blue with anti-reflective coating.
	Frame type	Anodised Aluminium.
	Panel orientation	Panels will be installed in portrait which will form 'strings'. The 'strings'[1] of PV will be secured on single axis trackers that are configured north-south with varying azimuths (azimuth between -40° degrees and 40° degrees) and will track 60 degrees east-west, where the panels will turn from east to west during the course of the day. Strings will be in varying lengths depending on available space and field size, which will have 15, 30, 60 or 90 panels in portrait, this is illustrated on **Plate 3-1**.
Solar PV panel mounting structures Work No 1(a)	Rack	Each string of panels will be mounted on a rack made with galvanized steel appearance.
	Foundations	Galvanised steel poles driven into the ground to a maximum depth of 4m, subject to ground conditions or the presence of archaeology; these may require concrete foundations of concrete ballasts.

[1] A string consists of solar PV panels that are wired in a series to one inverter.

Scheme Component	Parameter Type	Applicable Design Principle
	Separation distance between rows	The minimum inter row distance will be 1.6m and the maximum will be 3.8m.
	Minimum height above ground level (agl)	The height of the bottom of the panel above ground level will be at a minimum of 0.6m, which is when the panel is at maximum tilt. The height of the panel above ground level will be at a minimum of 1.5m when the panel is lying horizontal (refer to **Table 3-3**). Solar panels within Fields 56, 57 and 51 (refer to **Figure 3-1** of the ES **[EN010142/APP/6.3]**) will not be installed lower than 20.06 m AOD to mitigate the risk of flooding from the Yewthorpe Beck surface water ditch.
	Maximum height above ground level (agl)	The height of the bottom of the panel above ground level will be a maximum of 2.5m, which is when the panel is lying horizontal. The height of the top of the panel above ground level will be at a maximum of 3.5m when the panel is at maximum tilt (refer to **Table 3-3**).

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

(b) solar stations

Work No. 2— battery energy storage systems including—

(a) BESS;

(b) a structure protecting the BESS comprised in Work No. 2 (a) and ancillary equipment, being either one container or multiple containers within a larger building or buildings laid on a concrete slab or raft foundation located alongside Work No. 1(b);

(c) heating, ventilation and air conditioning (HVAC) or liquid cooling systems 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) monitoring and control systems housed within the containers with the HVAC or liquid cooling systems in Work No. 2(c) or located separately in its own container or control room;

(e) battery management system to monitor and control the stage of charge, temperature, and the overall health of the batteries;

(f) DC/DC converter;

(g) fire safety infrastructure, mitigation and control measures including:

Scheme Component	Parameter Type	Applicable Design Principle
(i) fire service access, (ii) fire compartmentation measures, (iii) water storage tanks and hydrants, (iv) impermeable membrane surrounding the BESS which directs fire water to a swale for containment and a sump and drain valve to allow the extraction of contaminated fire water, (v) hard standing to accommodate emergency vehicles, (vi) parking spaces; and (h) electrical cables connecting to Work No. 1(b), and Work No. 3.		
Solar Station and Battery Energy Storage Systems (BESS) Station Work No 1(b) and 2 (a) to (h)	Type	The location of BESS and Solar Stations are shown on **Figure 3-1 [EN010142/APP/6.3]**. The BESS configuration will be DC-coupled which means they will be spread across the Principal Site and co-located alongside the Solar Stations, prioritising the cable length to minimise losses. A Solar Station will comprise of a Direct Current (DC)/Alternating Current (AC) inverter and a Low Voltage (LV)/Medium Voltage (MV) transformer, including switchgear. A BESS Station will comprise Battery Containers and DC/DC Converter. There will be no Solar Stations and BESS Stations within 250m of a residential property. Further detail on the BESS and Solar Stations is given below.
	Dimensions	The maximum area for a BESS Station and Solar Station compound will be 48m in length by 30m in width and 4m in height. See **Figure 3-2 and Figure 3-3 [EN010142/APP/6.3].** This will contain the Solar Station comprising transformer, switchgear and inverter, BESS container, DC/DC converter, interconnecting cables between the components and a parking area. Note these dimensions do not represent a fully built out form but set out the dimensions for an area within which various individual components will be located. The size of individual components is set out in rows below.
	Colour	Externally finished in keeping with the prevailing surrounding environment, likely to be shades of white, grey or green painted finish.

Scheme Component	Parameter Type	Applicable Design Principle
	Number	There will be a maximum of up to 140 BESS and Solar Stations, which are co-located across the Principal Site.
Solar Station Components (a station comprising an inverter, a transformer and the switchgear) Work No 1(b)	Type of Inverter	Decentralised inverters, placed inside housing.
	Dimensions of inverters	Inverters will be 3m in length by 2m in width by 3m in height.
	Type of Transformer	The transformer will either be 'outdoor' (i.e., installed as it is) or 'indoor' (within container type housing).
	Colour of Transformers	Externally finished in keeping with the prevailing surrounding environment, likely to be shades of white, grey or green painted finish.
	Type of Switchgear	The switchgear will either be outdoor or within container type housing.
	Dimensions of switchgear and transformer	The switchgear together with the transformer housing will have a maximum dimension of 5.5m in length by 2.5m in width by 3m in height.
	Colour of switchgear	Externally finished in keeping with the prevailing surrounding environment, likely to be shades of white, grey or green painted finish.
	Foundations	A concrete foundation slab for each of the inverters, transformers and switchgear and a levelling layer of thick sand underneath the slab with a maximum depth of 1m. The maximum width and length of each foundation slab is the length +0.5m and the width +0.5m of the component.
BESS Station Components (Battery Containers and DC/DC Converter) Work No 2 (a) to (h)	Dimensions	The footprint for each BESS Battery container will be a maximum of 12.5m in length, 3m in width and 4m in height which will house the BESS. The DC/DC converter will be installed alongside every BESS battery container to keep cabling as short as possible and losses low. The footprint for each DC/DC converter would be up to 2.5m in length by 1.2m in width by 2.8m in height.

Scheme Component	Parameter Type	Applicable Design Principle
		The battery will utilise the inverter, transformer and switchgear within the Solar Station to operate, isolate and control the imported and exported power to and from the BESS.
	Fire Management	Refer to the **Framework Battery Safety Management Plan (FBSMP) [EN010142/APP/7.13]**.
	Foundation	Either a reinforced concrete base to a maximum depth of 1m, with the maximum width and length being the length +0.5m and the width +0.5m of the BESS Battery Containers and DC/ DC converter; or a piling solution may be required, depending on the results of geotechnical surveys. If this is the case, piles to a maximum depth of 12m would be used. The piling solution has been assessed as the worst-case scenario within **Chapter 6** to **18** of this ES **[EN010142/APP/6.1]** justification is presented within the relevant technical chapter.

Work No. 3— development of onsite substations and associated works including—

(a) Works 3A – Substation A

(i) substation comprising main components of 400kV Gas Insulated Switchgear, 400kV Cable Sealing End, 400kV Surge Arrester, 400kV Post-Insulator, 2 x 400/33kV, 150/75/75 MVA Transformers, 400kV shunt reactor, 400kV gas insulated bus duct, 33kV Switchgear, 33kV Cabling and auxiliary equipment;

(ii) substation buildings including building to accommodate 400kV switchgear, buildings to accommodate 33kV switchgear and associated control and protection equipment, control room building to accommodate protection and control cabinets and auxiliary boards and panels and a diesel generator;

(iii) hardstanding, internal access road and parking areas; and

(iv) a water storage structure (swales) to collect and treat surface water before discharge.

(b) Works 3B – Substation B

(i) substation, comprising main components of 400kV Gas Insulated Switchgear, 400kV Cable Sealing End, 400kV Surge Arrester, 400kV Post-Insulator, 2 x 400/33kV, 150/75/75MVA Transformers, 400kV gas insulated bus duct, 33kV Switchgear, 33kV Cabling and auxiliary equipment;

Scheme Component	Parameter Type	Applicable Design Principle
(ii) substation buildings including building to accommodate 400kV switchgear, buildings to accommodate 33kV switchgear and associated control and protection equipment, control room building to accommodate Protection and Control cabinets and auxiliary boards and panels and a diesel generator; (iii) hardstanding, internal access road and parking areas; and (iv) a water storage structure (swales) to collect and treat surface water before discharge.		
Onsite Substations Work No 3 (a) and (b)	Type	The substations will consist of electrical infrastructure, including transformers and switchgear. There will also be ancillary equipment used to facilitate the export/import of electricity from/to the Principal Site to/from the National Grid.
	Location	There will be a total of 2 substations, Substation A and Substation B, located within the Principal Site, each will serve approximately one half of the Scheme.
	Components	Each substation will contain the following main components: • 400 kV Gas Insulated Switchgear (GIS); • 400 kV Cable Sealing Ends; • 400 kV Surge Arresters; • 400 kV Post-Insulators; • 2 x 400/33 kV, 150/75/75 MVA Transformers; • 400 kV shunt reactor (Substation A only); • 400 kV gas insulated bus duct; • 33 kV Switchgear; and • 33 kV Cabling. All of these components are illustrated on **Figure 3-4a, Figure 3-4b, Figure 3--5a** and **Figure 3-5b [EN010142/APP/6.3].**
		Apart from the above main equipment, there will be auxiliary equipment: • Low Voltage AC distribution board; • Low Voltage DC distribution board;

Scheme Component	Parameter Type	Applicable Design Principle
		• Battery and Charger panel; • The power panel for security lighting; • Protection and Control Panels; • Telecom and Metering Panels; • Lightning protection masts; and • Compound lighting. All of these components are illustrated on **Figure 3-4a, Figure 3-4b, Figure 3-5a** and **Figure 3-5b [EN010142/APP/6.3].**
		The following buildings will be located inside the substation boundary: • GIS building to accommodate switchgear; • 400 kV transformers; • 400 kV shunt reactor; • 33 kV buildings to accommodate 33 kV switchgear and associated control and protection equipment; • Control room building to accommodate Protection and Controls cabinets and auxiliary boards and panels; and • Diesel Generator. All of these components are illustrated on **Figure 3-4a, Figure 3-4b, Figure 3-5a** and **Figure 3-5b [EN010142/APP/6.3].**
	Dimensions	The onsite substation footprint is up to 108m in width by 115m in length with a concrete access track and crushed stone hardstanding throughout. The 400kV switchgear building will be up to 43m in length by 15m in width by 10m in height. It is likely to be a portal steel structure with coloured profile steel cladding, selected to minimise visual impact. The 33kV switch rooms will be up to 20m in length by 5m in width by 6m in height. The control building would be around 25m in length by 18m in width by 7m in height

Scheme Component	Parameter Type	Applicable Design Principle
	Number of parking spaces	Substations A and B will have 4 parking spaces each to meet the needs of operational parking requirements.
	Foundations	There will be a foundation slab for each of the following at each substation: 400kV switchgear building, two 33kV switch room buildings, two 400 kV transformers, one 400 kV shunt reactor (Substation A only), a control building and a backup generator. Foundation slabs typically will be a concrete foundation slab with a levelling layer of thick sand, the depth will be a maximum of 1m, with the length +0.5m and the width +0.5m of the onsite substation; or a piling solution may be required, depending on the results of geotechnical surveys. If this is the case, piles to a maximum depth of 12m would be used. The piling solution has been assessed as the worst-case scenario within **Chapter 6** to **18** of this ES **[EN010142/APP/6.1],** with justification for this presented within the relevant technical chapter.

Work No. 4— works in connection with high voltage electrical cabling including—

(a) Work No. 4A – works to lay high voltage electrical cables including-

(i) connecting Work No. 3A to Work No. 3B;

(b) Work No. 4B – works to lay high voltage electrical cables, access and construction compounds for the electrical cables including-

(i) works to lay 400kV electrical cables connecting to Work No. 4A;

(ii) works to lay 400kV electrical cables connecting to Work No. 4C;

(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;

(v) marker posts, underground cable marker, tiles and tape, communications chambers, fibre optic cables and lighting and other works associated with cable laying; and

(vi) tunnelling, boring and drilling works.

Scheme Component	Parameter Type	Applicable Design Principle

(c) Work No. 4C – works to lay high voltage electrical cables, access and construction compounds for the electrical cables including –

(i) works to lay 400kV electrical cables connecting to Work No. 4B;

(ii) works to lay 400kV electrical cables connecting to Work No. 4D;

(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;

(v) marker posts, underground cable marker, tiles and tape, communications chambers, fibre optic cables and lighting and other works associated with cable laying;

(vi) tunnelling, boring and drilling works;

(d) Work No. 4D – works to lay high voltage electrical cables, access and construction compounds for the electrical cables including –

(i) works to lay 400kV electrical cables connecting to Work No. 4C;

(ii) works to lay 400kV electrical cables connecting to Work No. 4E;

(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;

(v) marker posts, underground cable marker, tiles and tape, communications chambers, fibre optic cables and lighting and other works associated with cable laying; and

(vi) tunnelling, boring and drilling works.

(e) Work No. 4E – works to lay high voltage electrical cables, access and construction compounds for the electrical cables including –

(i) works to lay 400kV electrical cables connecting to Work No. 4D;

(ii) works to lay 400kV electrical cables connecting to Work No. 5;

(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;

Scheme Component	Parameter Type	Applicable Design Principle
(v) marker posts, underground cable marker, tiles and tape, communications chambers, fibre optic cables and lighting and other works associated with cable laying; and (vi) tunnelling, boring and drilling works.		
Cable Route Corridor Work No 4 (a) to (e)	Length of cable route	To connect the Principal Site to National Grid Cottam Substation, 400kV cables would be installed. The total length of the cable run within the Cable Route Corridor is approximately 18.5km. The total length of the cable run within the Principal Site is approximately 8.5km.
	Cable dimensions	The cable within the Cable Route Corridor will be 400kV and approximately 115mm (nominal) in diameter.
	Number of circuits	One single circuit comprising of 3 cables laid in trefoil formation.
	Number of trenches	One trench is required for each of the circuits.
	Location	All Cable Route Corridor cables would be installed at a minimum distance of 10m from the façade of any residential building.
	Scale	The construction width for the Cable Route Corridor will be up to 40m wide.
	Trench depth / width (permanent)	Trench depth will be up to a maximum of 2m in depth and up to a maximum 3.5m in width for general installation. For trenchless crossings this will be deeper for construction purposes with a maximum of 5m below utilities, and a minimum of 10m below Network Rail infrastructure. For watercourses, the minimum depth is 3m and maximum depth is 5m. This is with the exception of the River Till and the River Trent where cables will be installed at a minimum of 5m below the lowest surveyed point of the riverbed, and a maximum depth of 25m, depending on the ground investigation results. The requirement of minimum 5m below the lowest surveyed point of the riverbed is to avoid the mobilisation of silt from the riverbed and the risk of scour exposing the cable, which will also avoid impacts on fish and the navigational safety of the River Trent.

Scheme Component	Parameter Type	Applicable Design Principle
	Trench depth / width (temporary)	The trench could be temporarily wider (benched) for slope on the trench sides to ensure operatives' safety. The slope size will be defined by temporary works design. The construction width for the Cable Route Corridor is allowed as 40m wide but will vary locally to accommodate constraints such as cross slopes in the terrain, jointing bays, and trenchless crossing areas.
	Drainage Ditch (Temporary)	A trench will be dug to provide drainage across the Cable Route Corridor during construction. This ditch will be a maximum of 2.0m in width and a maximum depth of 1.5m.
	Jointing Bays	Jointing bays will be required up to 1,000m apart to join sections of cable together. The dimensions of the jointing bay would be up to 21m in length by 3m in width by 2.5m in depth. The proposed cable jointing area shall be formed using four precast concrete units approximately 2.0m in length and 3.0m wide for ease of construction. The minimum jointing area excavation required shall be a minimum of 8.0m in length by 3.0m in width by 2.5m depth.
	Link and Communications Box	A link and communications box pit of up to a maximum of 5m in length by a maximum of 5.5m in width and a depth of 1.3m will be required next to every jointing bay.
	Crossing types	There are several crossings required throughout the Scheme. For major crossing points across main rivers and railway lines and other locations, a trenchless solution will be used. For minor roads and tracks, hedgerows and field drains, an open cut method will be applied. This is discussed in detail in paragraphs 3.4.33 to 3.4.37 and **Table 3-5**.
	HDD Crossings Platform (Trenchless Crossing)	These will require a granular platform 60m in length, 40m in width and 1m in depth for both drilling and receiving.

Scheme Component	Parameter Type	Applicable Design Principle
	Thrust Bore Crossings (Trenchless Crossing)	These will utilise precast concrete manholes which have a 3.0m internal diameter and are proposed to act as the drilling and receiving pits for Thrust Bore Crossings.
Work No. 5 – works to the National Grid Cottam substation to facilitate connection of the authorised development to the National Grid Cottam substation including – (a) busbars and connectors to connect to the existing busbar disconnectors at the National Grid substation; (b) a 400kV 3phase circuit breaker for control and protection of the outgoing circuit serving the authorised development; (c) a 3phase set of current transformers for protection of the new outgoing 400kV feeder circuit and the overlap with the National Grid system; (d) a 3phase high accuracy metering current and voltage transformer assembly for commercial metering of the connection; (e) a 3phase 400kV line disconnector/earth switch for isolation and earthing of the outgoing 400kV feeder circuit; (f) a 3phase set of 400kV high voltage cable sealing ends and cables connecting the National Grid substation with Work No. 4; and (g) protection and control works in the existing relay room or erection of new building to house protection and control works apparatus if required.		
Works to the National Grid Cottam substation Work No. 5	Type	There are electrical and cabling works which are required to connect the Scheme to a connection bay at the National Grid Cottam Substation, which will involve equipment modification work and outdoor termination structures outside of the bay. Further detail is provided in Section 3.4 of this chapter, as well as the **Works Plan [EN010142/APP/2.3].**
Work No. 6 – works including – (a) electrical cables, including but not limited to electrical cables connecting Works No. 1, 2 and 3 to one another, connecting solar panels to one another, connecting the solar panels to the BESS, the solar stations and on-site substations, including tunnelling, boring and drilling works for trenchless crossings; and open trench crossings; (b) site establishments and preparation works, including site clearance (including vegetation removal, demolition of existing buildings and structures); earthworks (including soil stripping and storage and site levelling) and excavations; the alteration of the position of services and utilities; and works for the protection of buildings and land;		

Scheme Component	Parameter Type	Applicable Design Principle
(c) laying down of permissive paths; (d) hardstanding and parking areas; (e) sustainable drainage systems including swales, runoff outfalls, general drainage and irrigation infrastructure, systems and improvements or extensions to existing drainage and irrigation systems; (f) fencing, gates, boundary treatment and other means of enclosure; (g) works for the provision of security and monitoring measures such as CCTV columns, cameras, lighting columns and lighting, weather stations, perimeter fencing and communication infrastructure; (h) improvement, maintenance and use of existing private tracks; (i) works to maintain and repair streets and access roads; (j) laying down of internal access tracks, ramps, means of access, footpaths, crossing of watercourses and roads, including the laying and construction of drainage infrastructure, signage and information boards; (k) electricity, water, waste water and telecommunications connections including pressurised water pipes; and (l) other works to mitigate any adverse effects of the construction, maintenance, operation or decommissioning of the authorised development.		
On-site cabling (between PV panels, inverters within the Solar Stations and BESS) Work No 6(a)	Type	Low voltage within Principal Site electrical cabling is required to connect the solar PV panels to the Solar Stations and the Solar Stations and BESS to the inverters (typically via 1.5kV cables). Cabling between PV panels and the inverters will be along the racks, fixed to the mounting structure, and then buried underground in trenches from the racks to the Solar Stations.
	Cable dimensions	To be determined on completion of cables sizing calculations (detailed design).
	Cable trench dimensions	The dimension of the trenches will vary depending on the number of ducts they contain but would be a maximum of 4m in width and 1.2m in depth. Where the DC cables from the panel strings converge to connect to the inverter within the Solar Station the maximum width of the trench will be 6m wide as up to 20 pairs of cables will connect to the inverter within the Solar Station. The maximum depth of a trench will be 0.85m.
	Type	33kV power cables single-core.

Scheme Component	Parameter Type	Applicable Design Principle
On-site (underground) cabling (between transformers and on-site substations) Work No 6(a)	Cable dimensions	The approximate overall diameter of each power cable will be 70mm.
	Cable trench dimensions	The 33kV cable trenches will be up to 1m wide and 1.7m deep for general installation.
Permissive paths Work No 6(c)	Location	The inclusion within the Principal Site of two permissive paths connecting from Common Lane to Northlands Road and Common Lane to Kexby Road.
	Scale	The permissive paths will be located within a corridor that measures 25m in width.
	Design	The permissive paths will be suitable for pedestrians, cyclists and horse riders.
Surface Water Drainage Work No. 6(e)	Design	The **Outline Drainage Strategy** (refer to **Appendix 10-4** of this ES **[EN010142/APP/6.2]**) sets out the design principles for surface water drainage. The design will ensure compliance with planning policy with runoff from the Scheme to be attenuated to ensure no increase in surface water discharge rates and to provide water quality treatment of runoff water. Attenuation in the form of swales has been incorporated to control any increase in the rate of flow towards the receiving watercourses. The drainage strategy also allows for fire water containment by providing a penstock arrangement on lined swales surrounding each BESS. Fire water runoff within the swale surrounding the BESS will be held and tested before either being released into the surrounding watercourses or taken off site by a tanker for treatment elsewhere. The swale will then be cleaned of all contaminants. The swale will be underlain with an impermeable liner to prevent any contaminants entering the ground. Where possible, surface water will drain from the Scheme's swale based drainage system to local receiving watercourses via a new ditch, or the piped section will be shortened and the last 10 m section of the outfall route will be open ditch unless this affects maintenance of the channel by the Internal Drainage Board.

Scheme Component	Parameter Type	Applicable Design Principle
Fencing and security lighting Work No 6(f)	Maximum Height	A security fence will enclose the operational areas of the Principal Site. This will be a deer fence, up to a maximum of 2.5m in height. The BESS and Solar Stations will be enclosed by metal security fencing that is a maximum of 2.5m in height to comply with British Standard (BS) EN 62271-1:2017. Pole mounted internal facing closed CCTV systems up to a maximum of 3m high will be deployed around the perimeter of the operational areas of the Principal Site. During operation, permanent security lights with motion detectors will be used for security purposes around the electrical infrastructure, emergency access points to facilities within the Scheme and potentially at other pieces of critical infrastructure.
Internal access tracks Work No. 6(h)	Scale	The proposed internal access tracks will be compacted stone tracks up to 4m wide with 1:2 gradient slopes on either side.
	Scale	The primary access points (Principal Site Accesses 1, 2, 3 and 4) will be wider, up to a maximum of 6m.
	Design	Internal access tracks within the Principal Site will use existing farm tracks as much as possible, upgrading surfaces as required. The creation of new access tracks will be minimised.
Work No. 7 – construction and decommissioning compounds including— (a) areas of hardstanding; compacted ground or track matting; (b) parking areas; (c) site and welfare offices, canteens and workshops; (d) security infrastructure, including cameras, perimeter fencing and lighting; (e) areas to store materials and equipment, waste skips and spoil; (f) site drainage and waste management infrastructure (including sewerage); and (g) electricity, water, waste water and telecommunications connections.		
Construction compounds	Number of compounds	Five temporary compound locations have been identified across the Principal Site and six for the Cable Route Corridor. The locations of these compounds are detailed in

Scheme Component	Parameter Type	Applicable Design Principle
Work No 7 (a) to (g)		Section 3.5 and presented on **Figure 3-6: Indicative Construction Compound Locations [EN010142/APP/6.3]**.
	Fencing height	Perimeter fencing for the construction and decommissioning compounds would be up to a maximum of 2.5 metres in height. Security infrastructure including cameras would be up to a maximum of 3m high around the perimeter of compounds.
Work No. 8 – works to develop a solar farm control centre and equipment storage including – (a) erection of a new building to accommodate the solar farm control centre including; (i) Central Control Room; (ii) Central CCTV and security control, including access gates to fenced areas; (iii) welfare facility for staff and subcontractors; (iv) parking area for staff and visitors; (v) independent power supply including emergency power supply; and (vi) equipment storage.		
Solar Farm Control Centre Work No 8 (a)	Type	The Solar Farm Control Centre will allow between 10- 12 staff to operate and maintain the plant, in dayshifts only.
	Number	There is one Solar Farm Control Centre.
	Dimensions	Up to 20m in length by 15m in width by 6m in height.
	Materials	Painted block construction (detailed design to be approved, including proposed materials prior to construction).
	Fencing height	Fencing around the Solar Farm Control Centre would be up to a maximum of 2.5 metres in height. Pole mounted internal facing closed CCTV systems up to a maximum of 3m high will be deployed around the perimeter.
	Foundations	Foundation slabs typically will be a concrete foundation slab with a levelling layer of thick sand, the depth will be a maximum of 1m, with the length +0.5m and the width +0.5m of the Solar Farm Control Centre; or a piling solution may be required, depending

Scheme Component	Parameter Type	Applicable Design Principle
		on the results of geotechnical surveys. If this is the case, piles to a maximum depth of 12m would be used. The piling solution has been assessed as the worst-case scenario within **Chapter 6** to **18** of this ES **[EN010142/APP/6.1],** with justification for this presented within the relevant technical chapter.
Equipment Storage Work No 8 (a) (vi)	Type	An area for the storage of materials required to maintain the operation of the Scheme.
	Number	There is one Equipment Storage Area.
	Dimensions	Storage containers will measure a maximum of 12m in length by a maximum of 2.5m in width by a maximum of 3m in height or equivalent shaded open storage area using a 3.2m high shade. A total area of up to a maximum of 1,200m^2 is required, and a maximum of 40 storage containers would be required.
	Foundations	Foundation slabs typically will be, a concrete foundation slab with a levelling layer of thick sand, the depth will be a maximum of 1m with the length +0.5m and the width +0.5m of the area.
Work No. 9 – areas of habitat management and protection including — (a) measures to enhance the existing woodland and hedgerows; (b) landscape and biodiversity enhancement measures; (c) habitat creation and management including earthworks and landscaping; (d) construction of drainage infrastructure and means of access; (e) laying down of internal access tracks, means of access and crossing of watercourses; and (f) fencing gates boundary treatment and other means of enclosure.		
Areas of habitat management and protection Work No. 9 (referred to as Biodiversity Zones)	Location	The areas of habitat management and protection, referred to as Biodiversity Zones, will be located on areas marked as Work No. 9 on the **Works Plan [EN010142/APP/2.3]**. The Biodiversity Zones will be established and managed in accordance with the **Framework Landscape and Ecological Management Plan (LEMP) [EN010142/APP/7.17]** and are illustrated on **Figure 3-1: Indicative Principal Site**

Scheme Component	Parameter Type	Applicable Design Principle
		Layout [EN010142/APP/6.3]. Further information on the Biodiversity Zones is presented within Section 3.4 of this chapter.
Work No. 10 – works to facilitate access to Work No. 1 to 9 including — (a) Work No. 10A— works to facilitate permanent access to Work Nos. 1 to 9 including; (i) alteration and improvement of existing road layout; (ii) creation of visibility splays; and (iii) street works to facilitate the construction of proposed accesses. (b) Work No. 10B— works to facilitate temporary construction and decommissioning access to Work Nos. 1 to 9 including: (i) creation of new access or improvement of existing access from the public highway; (ii) street works to facilitate the construction of proposed accesses and cable installation works; (iii) alteration of road layouts, including modifications to road markings and temporary removal of signage to facilitate abnormal load manoeuvres; (iv) alteration of road layout to facilitate localised carriageway widening for construction vehicles; and (v) alteration of road layout to facilitate the construction of passing bays. (c) Work No. 10C— works to facilitate permanent emergency access for fire service vehicles associated with Work No. 2 including: (i) alteration of existing road layout to facilitate the creation of new emergency accesses from the public highway including the creation of visibility splays; and (ii) street works to facilitate the construction of the proposed accesses.		
Site Access Work No 10 (a) to (c)	Type	There are a variety of temporary and permanent accesses required for the Scheme to facilitate and enable construction, operational and decommissioning activities as well as emergency services requirements. Highway works are required to establish these accesses so they are suitable for use. Further detail on access uses and highway works required are provided in Section 3.4 of this chapter, **Chapter 16: Traffic and Access** of this ES **[EN010142/APP/6.1]** and the **Framework Construction Traffic Management Plan [EN010142/APP/7.11].** Further detail on access improvements are provided on the **Streets, Rights of Way and Access Plan [EN010142/APP/2.4].**

Scheme Component	Parameter Type	Applicable Design Principle
	Number	There are a total of 36 accesses (including permanent, temporary and emergency accesses), locations of which are presented on **Figure 3-7: Access Locations [EN010142/APP/6.3]**.
Work No. 11 – sensitive archaeological site protection and management including — (a) habitat creation and management; (b) fencing gates boundary treatment and other means of enclosure.		
Sensitive Archaeological Site Work No 11	Type	The areas of Sensitive Archaeological Site (SAS) for protection and management will be located on areas where archaeological deposits have been identified through surveys. The management of the SAS will be in accordance with the **Framework LEMP [EN010142/APP/7.17].**
	Number and Location	There are 26 SAS located across the Principal Site, which are marked as Work No. 11 on the **Works Plan [EN010142/APP/2.3]** and illustrated on **Figure 3-1: Indicative Principal Site Layout [EN010142/APP/6.3].**

3.4 Components of the Scheme

3.4.1 Further description of the following components of the Scheme is presented within sections below:

a. Solar PV infrastructure consisting of solar PV panels and mounting structures;

b. Solar Stations (inverter, transformer and switchgear);

c. BESS;

d. On-site substations;

e. Electricity connection to the National Grid Cottam Substation via Cable Route Corridor;

f. Public Rights of Way works;

g. On-site cabling;

h. Permissive paths;

i. Surface water drainage;

j. Fencing and security lighting;

k. Internal access tracks;

l. Construction compounds;

m. Solar farm control centre;

n. Equipment storage;

o. Biodiversity Zones;

p. Site accesses;

q. Highway works and road closures; and

r. Sensitive Archaeological Sites.

Solar PV Panels

3.4.2 Illustrative figures of the solar PV panels are provided in **Plate 3-1** to and **Plate 3-2**.

3.4.3 The layout of the solar PV panels has been determined through consultation with landowners, statutory undertakers and the local community through an iterative design shared during statutory consultation. Utilities within the Principal Site and the stand offs to the Scheme infrastructure are outlined below and are illustrated on **Figure 3-1 [EN010142/APP/6.3]**:

a. A Uniper gas pipe running north east to south west, with a 26m wide (total) stand-off;

b. ‘West Burton B’ gas pipe across Field 1 only, with 7m wide stand-off;

c. A Cadent gas pipe running east to west, with 65m wide stand-off; and

d. 33kV and 11kV overhead lines, with a 10m easement where feasible, minor realignment of the overhead lines may be required in consultation with the statutory undertaker.

3.4.4 This list of utilities is based on information made available through searches of utility records which statutory owners have an obligation to register. There is the potential for unregistered utilities to be located on the Principal Site, however these are unlikely to involve major supply of electricity, gas or water. However, if other utilities are identified during construction, then an easement of 7m will be incorporated.

3.4.5 Solar PV panels convert sunlight into electrical current as DC. Individual panels used in large-scale projects are typically between 2m to 2.5m in length and 1m to 1.4m in width and are typically 'bifacial', meaning that they consist of a series of photovoltaic cells beneath a layer of toughened glass. The panel frame is typically built from anodised aluminium.

3.4.6 To ensure that the likely significant environmental effects are fully assessed, the DCO Application will secure the maximum parameters for both the solar PV panels and associated development as set out in **Table 3-2**. This will ensure that the DCO considers the environmental impacts in full and is based upon a set of worst-case assumptions as set out in **Chapters 6** to **18** of this ES **[EN010142/APP/6.1];** justification for this is presented within the relevant technical chapters. Various factors will help to inform the number and arrangement of panels in each string, and it is likely some flexibility will be required to accommodate future technological developments.

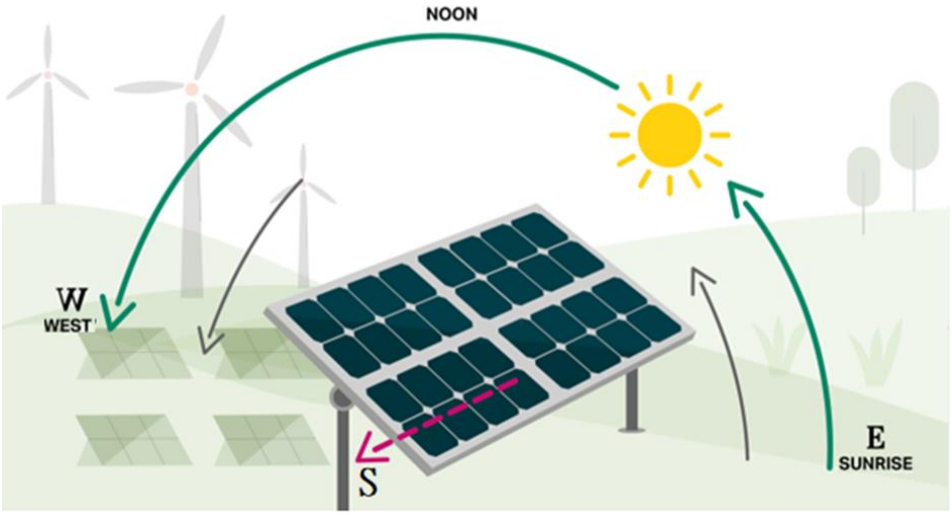
Plate 3-1: Illustrative image of panels and trackers[2]

3.4.7 Each panel could have a watt-peak capacity of between 400 and 1000 watts as technology evolves. Panels will be fixed with clamps onto tracker mounting structures (refer to **Plate 3-1**). The panels are fixed to a mounting structure in groups known as strings.

[2] Image taken from a Solar Scheme in Australia

3.4.8 The strings of PV panels will be secured on single axis trackers that are configured in rows generally orientated north-south and which will track 60 degrees east-west (refer to the illustration in **Plate 3-2)**. The panels will move from east to west during the course of the day operated by a motor, so that they are most upfront (up to 60 degrees) at the start of the day facing east, moving gradually into a horizontal position when the sun is at its highest point in the sky for the day, and then gradually into a near upright position (up to 60 degrees) facing west at the end of the day. Each row of panels is fitted with a light meter which dictates the pace of movement; the rows across the Principal Site therefore move at slightly different times throughout the day. The noise from each individual motor will be less than 40dB at a 1m distance (which is the equivalent of a home refrigerator). Assessment of noise and vibration from the components of the Scheme is presented in **Chapter 13: Noise and Vibration** of this ES **[EN010142/APP/6.1]**.

Plate 3-2: Illustrative Single Axis Trackers (Source: Recurrent Energy)

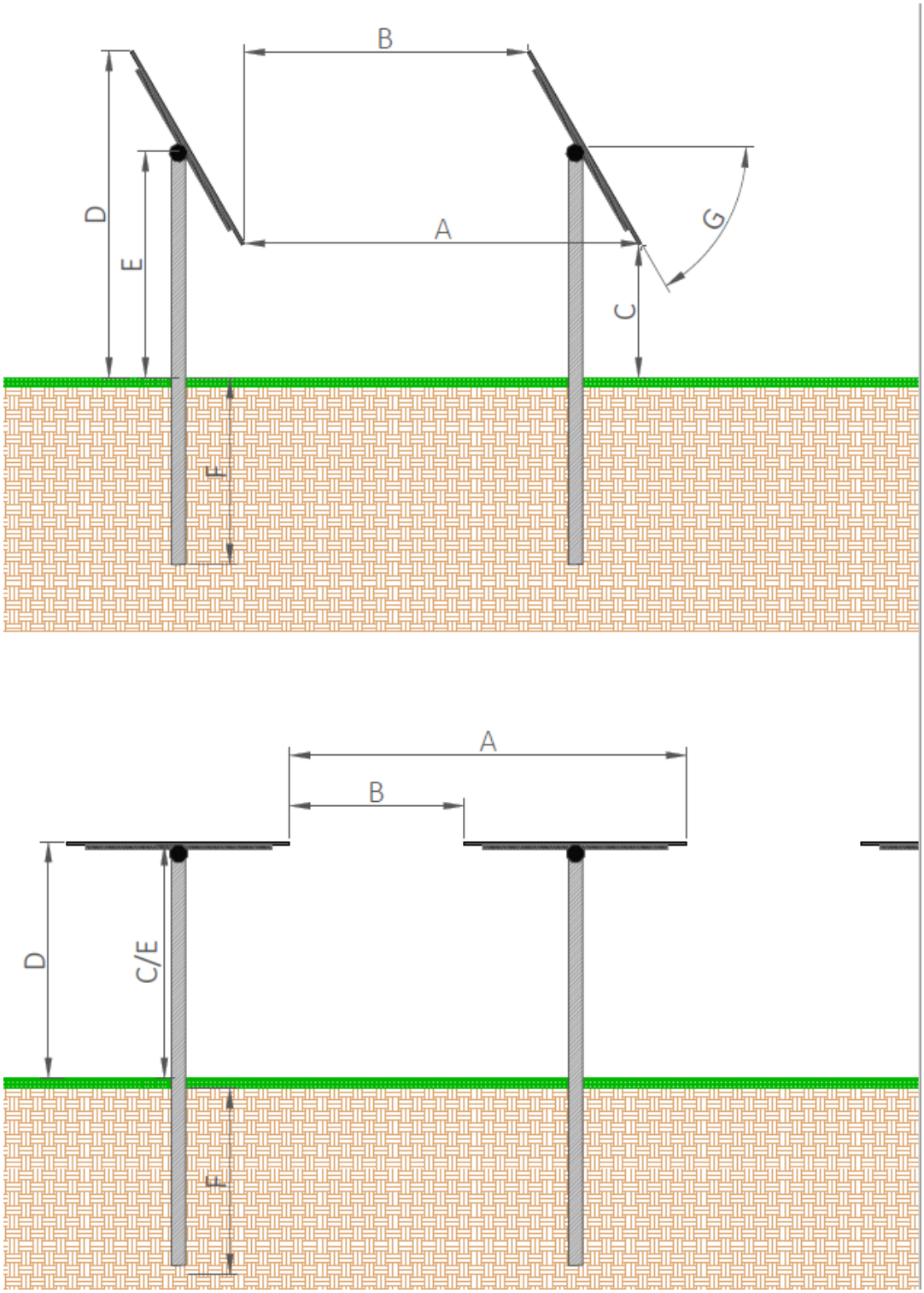


3.4.9 Each string of PV will be mounted on a rack. Minimum and maximum design parameters are shown in **Table 3-3** and illustrated on **Plate 3-3**.

Table 3-3: Minimum and Maximum Parameters of String PV

ID	Item	Minimum Value	Maximum Value	Unit
A	Pitch	4.0	5.0	M
B	Interrow distance	1.6	3.8	M
C	Clearance at maximum tilt	0.6	1.5	M
D	Height at maximum tilt	2.6	3.5	M
E	Axis height	1.5	2.5	M
F	Ground penetration	-	4.0	M
G	Tilt	-60	60	Degrees

Plate 3-3: Illustrative Section of PV Strings



3.4.10 The clearance of the PV panels above the ground will be between 0.6m and 1.5m reflective of the tracker panel moving east to west during the day. The Solar PV panels within Fields 56, 57 and 51 (refer to **Figure 3-1** of the ES **[EN010142/APP/6.3]**) will not be installed lower than 20.06 m AOD to mitigate the risk of flooding from the Yewthorpe Beck surface water ditch.

3.4.11 The maximum height of the panels when at maximum tilt above the ground will be 3.5m. Panels will be fitted with sensors, which during a storm event will enable the panels to be tilted to their maximum height above the ground.

Solar Stations (Inverter, transformer and switchgear)

3.4.12 A Solar Station (refer to **Plate 3-4**) comprises a DC/AC inverter and a LV/MV transformer, with switchgear. There will be up to a maximum of 140 Solar Stations within the Scheme co-located alongside BESS Stations. The transformer and switchgear will either be 'outdoor' (i.e., installed as it is) or 'indoor' (within container type housing), and inverters would be placed inside housing. Solar Stations will be located across the Principal Site at generally regular intervals and will be externally finished in keeping with the prevailing surrounding environment. It is anticipated that Solar Stations would be installed on a concrete foundation slab for each of the inverters, transformers and switchgear and a levelling layer of thick sand with a maximum depth of 1m, with a concrete perimeter pavement for the switchgear. The maximum width and length of each foundation slab is the length +0.5m and the width +0.5m of the component.

Plate 3-4: **Illustrative Solar Station DC/AC inverter, transformer and switchgear (Source: Recurrent Energy)**

Note: The components from left to right are: Inverter, transformer, and then switchgear

Inverters

3.4.13 Inverters are required to convert the DC electricity generated by the solar PV panels into AC, which allows the electricity to be exported to the National Grid. Inverters are sized to deal with the level of voltage and other electrical parameters generated by the solar PV panels. The inverters will be up to a maximum of 3m in length by a maximum of 2m in width and a maximum of 3m in height.

LV/MV Transformers and Switchgear

3.4.14 LV/MV transformers are required to transform the low voltage electricity generated across the site to medium voltage within the Principal Site to allow onward transmission to the National Grid via two on-site substations. Transformers are weather resistant and can be installed outdoor (i.e. installed as is) or are sometimes 'indoor' (within container type housing). The maximum dimensions of the transformer and switchgear will be 5.5m in length by 2.5m in width by 3m in height.

3.4.15 Switchgear are the combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment. Switchgear are used to de-energise equipment to allow work to be done and to clear faults downstream. Switchgear are generally located within or next to the transformer housing.

Battery Energy Storage Facility (BESS)

3.4.16 The principal purpose of the Scheme is to seek consent for the development of a ground mounted solar photovoltaic generating station. The BESS is associated development to ensure that energy can be stored when it is generated and not demanded. The BESS will have a direct relationship with the solar PV panels and it will support the operation of this by storing electricity produced during times of peak capacity until it needs to be released. This increases the efficiency of the principal development as a renewable energy project aiding both its operation as a generation station and the export of electricity to the National Electricity Transmission System (NETS). The operation of the BESS is dependent on the operation of the solar generation capacity. The BESS will also include an import connection to support the grid, but this will be subordinate to the principal (solar) development.

3.4.17 The Scheme will be DC-coupled, which means electricity flows from solar panels and directly feeds into a battery system with no inversion of electricity from DC to AC and back to DC before storage in the batteries. Batteries will be located in individual containers or housed within a larger building or buildings, typically coming in containerised solutions, distributed across many locations across the Principal Site. There will be up to a maximum of 140 BESS Stations co-located with Solar Stations, distributed across the Principal Site. **Figure 3-1** of this ES **[EN010142/APP/6.3]** comprises an Indicative Principal Site Layout Plan and shows the potential number and distribution of BESS and Solar Stations across the Scheme. The number of Solar Stations and BESS is determined by requirements from the National Grid to adequately supply energy. These are spread across the Principal Site, are co-located and placed at a minimum of 250m from any residential properties. The compounds will be accessed via proposed internal access roads and are broadly located centrally within each PV panel field parcel. The general layout of the BESS and Solar Stations would be uniform across the Scheme, but each compound would comprise a differing number of BESS containers and Solar Stations to meet technical and operational requirements.

3.4.18 The footprint of each BESS container would be a maximum of 12.5m in length by 3m in width by 4m in height. The BESS would be placed on a concrete slab foundation depending on ground conditions within a compound also containing the Solar Stations and associated car parking. The maximum footprint of the Solar Station and BESS compound will be up to 48m in length by 30m in width.

3.4.19 The overall compound housing the BESS and Solar Stations will be enclosed by metal security fencing that is a maximum of 2.5m in height. This is to comply with British Standard (BS) EN 62271-1:2017 (Ref. 3-2). Fire safety would also be incorporated into the design. This would include the addition of water tanks and hydrants and swales adjoining the concrete apron of the compound for dealing with general surface water runoff and to be deployed in an emergency fire event.

3.4.20 The exact locations (indicative locations are shown on the Indicative Principal Site Layout Plan in **Figure 3-1** of this ES **[EN010142/APP/6.3]**) of

the BESS are yet to be determined. Within the ES technical chapters, areas of BESS are assessed to be an appropriate buffer distance from residential property. For assessment purposes it will be at least 250m. As the BESS will be DC-coupled, it will be distributed across the Scheme and located alongside the Solar Stations, rather than an AC-coupled arrangement which is centralised in one or a few locations. An illustrative battery container is shown in **Plate 3-5**.

Plate 3-5: Illustrative Battery Container (Source: Recurrent Energy)

3.4.21 Each BESS includes an inbuilt heating, ventilation and cooling (HVAC) system or liquid cooling system to ensure the efficiency of the batteries by preventing overheating. This may involve a HVAC or liquid cooling system that is external to the containerised unit located either on the top of the unit or attached to the side of the unit. If this uses air to heat and cool it will have a fan built into it that is powered by auxiliary power. The HVAC or liquid cooling system is incorporated within the maximum parameters outlined in **Table 3-2**.

3.4.22 Every DC-coupled BESS will need an active electrical device which is the DC/DC converter (refer to **Plate 3-6**). The DC/DC converter manages the charge and discharge of the battery following the demand profile of the plant operator. It converts either the power to charge the battery from the solar PV panels or, for instance at night, from the grid. The DC/DC converter will also facilitate the discharge of the battery when required following specific demands by the network operator. A DC/DC converter will be installed next to every battery to keep cable runs as short and losses low. The footprint for each DC/DC converter would be up to 2.5m in length by 1.2m in width by 2.8m in height.

3.4.23 A **Framework Battery Safety Management Plan (**FBSMP) **[EN010142/APP/7.13]** has been prepared to support the DCO Application. This sets out the parameters for the management of fire risk associated with the BESS. This management plan will form the basis for the preparation of a fully detailed fire safety management plan at a later stage to ensure the delivery of a robust fire safety strategy in relation to the BESS and will be

secured as a Requirement of the DCO. The key principles with respect to the approach to risk mitigation contained within the FBSMP are as follows:

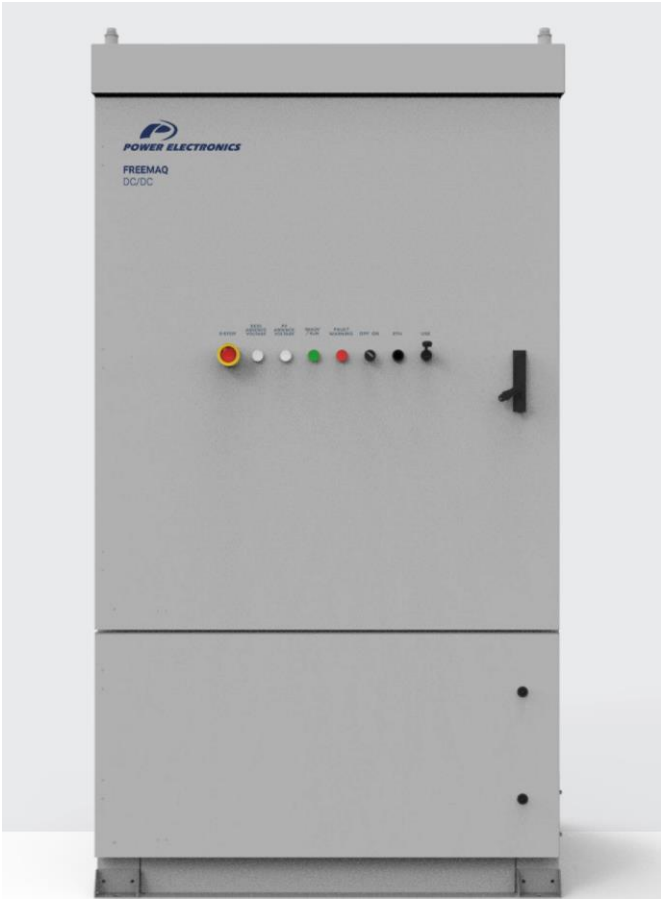
a. Fire safety design measures incorporated into the Scheme.

b. Guards and protective devices such as BESS disconnection and shutdown controls.

c. Information and training for end users.

d. Risk mitigation and control measures including cell manufacturing, transport, installation and decommissioning, fire compartmentation and fire service accessibility, fire detection, fire suppression, ventilation, cooling and heating and drainage.

Plate 3-6: Illustrative DC/DC Converter (Source : Recurrent Energy)



On-site Substations

3.4.24 There will be two substations on the Principal Site, Substation A in the south of the Principal Site and Substation B in the north; operating at 400kV/33kV. Each substation compound would have a footprint of up to 115m in length by 108m in width (see **Figure 3-4a, Figure 3-4b, Figure 3-5a** and **Figure 3-5b [EN010142/APP/6.3]** for the Substation Elevation and Layout **[EN010142/APP/6.3])**. It is noted that the tallest point of each substation would be 10m, with other equipment in the substation to be built lower, but to allow flexibility for this to occur anywhere within the compound, a consistent maximum height of 10m is applied for the purposes of the assessment.

3.4.25 The substations will consist of electrical infrastructure, including transformers and switchgear. There will also be ancillary equipment used to facilitate the export/import of electricity from/to the Principal Site to/from the National Grid. This will include distribution boards and metering panels. Within each substation compound there will be a 400kV switchgear building, two 33kV switch room buildings, two 400 kV transformers, one 400 kV shunt reactor (Substation A only), a control building and a backup generator. The 400kV switchgear building will be up to 43m in length by 15m in width by 10m in height. It is likely to be a portal steel structure with coloured profile steel cladding, selected to minimise visual impact. The 33kV switch rooms will be up to 20m in length by 5m in width by 6m in height. The control building would be around 25m in length by 18m in width by 7m in height.

3.4.26 Lightning protection and compound lighting will also be installed as required at the detailed design stage. Lightning mast typical heights are 15m-25m, with the number and height to be determined when lightning protection studies are undertaken.

3.4.27 The 33kV switchgear and associated control rooms for the substation will be housed in buildings and each substation will need to be enclosed in a security fence which is a maximum of 3m in height. Four car parking spaces will be provided within each of the substation fenced areas for staff parking associated with routine and emergency maintenance.

3.4.28 The parameters for the on-site substations are also considered in **Table 3-2**.

Electricity Connection to National Grid via Cable Route Corridor

3.4.29 The electricity generated by the Scheme will be exported via cables from the on-site substations to National Grid Cottam substation. The Cable Route Corridor will require crossings over roads (single track and main roads), watercourses (Upper Witham and River Trent and their associated tributaries), the former railway line associated with the de-commissioned Cottam Power Station, land drains, East Midlands Railway providing services between Doncaster and Lincoln and utilities/statutory undertaker assets. A desktop study has been carried out for the Cable Route Corridor and a suitably sized cable proposed with installation depths and spacing of the cables to meet the civil and thermal rating requirements for each crossing.

3.4.30 To connect the Principal Site to Cottam substation, 400kV cables would be installed between the two. The total length of the cable run within the Cable Route Corridor is approximately 18.5km (approximate distance between the Principal Site and Cottam substation). A further 400kV underground cable circuit approximately 8.5km long will be required within the Principal Site, including to interconnect the two 400kV/33kV substations, see **Figure 3-8 [EN010142/APP/6.3]**.

3.4.31 In terms of installation, the three single-core cables will either be laid directly into trenches or into ducting that will be installed with the cables pulled through the ducting. The cables will be installed within a corridor, including both the permanent installation area and temporary working area. The cable

temporary working area will be approximately 40m in width, it is anticipated that this will be narrowed to 10m where the cable passes through hedgerows and trees to reduce the loss of vegetation, where possible. The Cable Route Corridor will be further refined during detailed design post consent of the DCO to take account of any unexpected localised issues, including but not limited to archaeological finds, implications with respect to protected species and reducing impacts upon trees and hedgerows, for example.

3.4.32 **Table 3-4** and **Figure 3-9 [EN010142/APP/6.3]** show the reduction of the Order limits since statutory consultation (presented in the Preliminary Environmental Information (PEI) Report). Where the Cable Route Corridor is significantly greater than 100m wide (taken to be where it is more than 130m width), justification is provided.

Table 3-4: Reduction in Cable Route Corridor from PEI Report to ES

Location on Figure 3-9	PEI Report Boundary	Final Order limits	Justification where corridor is greater than 130m wide
	Width (m)		
1	1646	123	-
2	503	103	-
3	602	130	-
4	350	243	-To accommodate optionality for cable route alignment in this location.
5	179	114	-
6	1177	119	-
7	255	100	-
8	488	101	-
9	675	130	-
10	924	100	-
11	1093	78	-
12	2133	101	-
13	585	78	-
14	994	96	-
15	342	Removed	-
16	188	100	-
17	661	110	-
18	1014	112	-
19	712	100	-

Location on Figure 3-9	PEI Report Boundary	Final Order limits	Justification where corridor is greater than 130m wide
	Width (m)		
20	1049	157	Additional space as a result of options in this area for the Network Rail crossing.
21	1099	260	Additional space as a result of options in this area for the Network Rail crossing.
22	936	92	-
23	1097	125	-
24	586	434	Additional space as a result of options in this area for the Network Rail crossing.
25	799	252	Additional space due to West Burton Solar Project [EN010132] solar panels and siting of a construction compound in this area.
26	644	213	Additional space due to options in proximity to an existing planning permission for two agricultural barns (West Lindsey District Council planning application ref. 145882).
27	182	75	-
28	114	114	-
29	474	197	Additional space due to options in proximity to an existing planning permission for two agricultural barns (West Lindsey District Council planning application ref. 145882).
30	519	149	Additional space to allow for the crossing beneath the River Trent.
31	598	206	Additional space to allow for the crossing beneath the River Trent.
32	456	194	Additional space to allow for access.
33	1035	175	Additional space to allow for access.
34	999	113	-

Location on Figure 3-9	PEI Report Boundary	Final Order limits	Justification where corridor is greater than 130m wide
	Width (m)		
35	1172	228	Additional space for crossing of Network Rail disused line.
36	1423	356	Additional space for a construction compound.
37	496	117	-
38	436	351	Additional space to allow for buried utilities.
39	519	519	Additional space to take in the extent of National Grid Cottam Substation.
40	432	531	Additional space to take in the extent of National Grid Cottam Substation.

3.4.33 In the case of cables laid in an open cut trench, a typical trench depth of up to a maximum of 2m and trench width of up to a maximum 3.5m is required. The trench could be temporarily wider (benched) for slope on the trench sides to ensure operatives' safety. The slope size will be defined by temporary works design. **Figure 3-10 [EN010142/APP/6.3]** provides a typical trenched cross-section. Where the Cable Route Corridor has a risk of encountering obstacles such as tree root systems, the width of the cable route (both permanent and temporary) may change locally.

3.4.34 Where the Cable Route Corridor crosses other infrastructure and natural features such as rivers or streams, the cables will need to be installed underground by trenchless crossing techniques. For example, trenchless crossings will be required to cross the former Cottam Power Station railway line, the River Trent and the East Midlands Railway.

3.4.35 Trenchless crossings up to a maximum depth of 3m (and even deeper for the River Trent and River Till– see below) have been assumed. A minimum depth of 3m below the bed of watercourses is required, to avoid any impacts, excluding the River Trent and River Till where cables will be installed by trenchless methods at a minimum of 5m below the lowest surveyed point of the river bed. The cable depth below the bed of River Trent and River Till is expected to be a maximum of 25 m (depending on the final ground investigation, and subject to appropriate consents being obtained). The requirement of minimum 5m below the lowest surveyed point of the riverbed is to avoid the mobilisation of silt from the riverbed and the risk of scour exposing the cable, which will also avoid impacts on fish and the navigational safety of the River Trent.

3.4.36 A figure indicating the current assumptions for the location of Trenched and Trenchless crossings is included in **Figure 3-11** of this ES **[EN010142/APP/6.3]** and outlined in **Table 3-5** below.

3.4.37 **Figure 3-12 [EN010142/APP/6.3]** provides a typical trenchless cross-section.

Table 3-5: Trenchless Crossings

Crossing ID	Feature Crossed		
	Water Body	Road/Track	Railway
T1	✓	✓	
T2	✓		
T3	✓	✓	
T4	✓		
T5	✓		
T6	✓		
T7	✓		
T8			✓
T9	✓		
T10	✓		
T11	✓		
T12	✓		
T13	✓ (River Trent)		
T14	✓		
T15		✓	
T16			✓
T17	✓		
T18	✓		
T19	✓	✓	
T20	✓		
T21	✓		
T22	✓		
T23		✓	

Crossing ID	Feature Crossed		
	Water Body	Road/Track	Railway
T24	✓		

3.4.38 It is anticipated that Trenchless crossings will either consist of Horizontal Directional Drilling (HDD) or Thrust Bore techniques. The HDD crossing will require a granular platform of 60m x 40m x 1.0m deep for both drilling and receiving pits while the Thrust Bore crossings will utilise precast concrete manholes which have a 3.0m internal diameter and are proposed to act as the drilling and receiving pits.

3.4.39 Jointing bays will be required up to 1,000m apart to join sections of cable together. For the single 400kV circuit from Cottam Substation to the proposed Substation A within the southern part of the Principal Site, as well as the second 400kV circuit connecting Substation A and Substation B, the dimensions of the jointing bay would be up to 21m in length by 3m in width by 2.5m in depth, see **Figure 3-13 [EN010142/APP/6.3]**. A link box pit of up to 2m in length by 2m in width would also be required situated within a few metres of the joint bay. The distance between jointing bays will be determined through the detailed design process and is dependent on existing infrastructure along the Cable Route Corridor, the cable specification and cable manufacturing length limitations.

3.4.40 As part of the cable route construction, a maximum of six temporary Construction compounds will be required along the Cable Route Corridor. Cable drums will be delivered to these compounds to be laid along the route, these are illustrated on **Figure 3-6 [EN010142/APP/6.3]**.

3.4.41 The Cable Route Corridor has been subject to an iterative design process. A range of likely constraints have determined the final optimal cable routing in consultation with the nearby Gate Burton Energy Park [EN010131], West Burton Solar Project [EN010132] and Cottam Solar Project [EN010133] schemes. Other considerations to get to the optimal design of the Cable Route Corridor have included technical engineering, environmental, land referencing, legal, and commercial factors.

Cottam Substation

3.4.42 The Cable Route Corridor comes from the south of Cottam Substation under the current landscape bund into land owned by EDF Energy and to a bay at the Substation.

3.4.43 A bay has been identified by National Grid as the point of connection, however, equipment modification work and outdoor termination structures outside of the bay will need to be installed to make it suitable for use. The anticipated works required include:

a. Busbars and connectors to connect to the existing busbar disconnectors at the National Grid substation;

b. A 400kV three-phase circuit breaker for control and protection of the outgoing circuit serving the authorised development;

c. A three-phase set of current transformers for protection of the new outgoing 400kV feeder circuit and the overlap with the National Grid system;

d. A three-phase high accuracy metering current and voltage transformer assembly for commercial metering of the connection;

e. A three-phase 400kV line disconnector/earth switch for isolation and earthing of the outgoing 400kV feeder circuit;

f. A three-phase set of 400kV high voltage cable sealing ends and cables connecting the National Grid substation with Work No. 4; and

g. Protection and control works in the existing relay room or erection of new building to house protection and control works apparatus if required.

On-site Cabling

3.4.44 Low voltage on-site electrical cabling is required to connect the solar PV panels and BESS to inverters (typically via 1.5 kV cables), and the inverters to the nearby transformers (typically via 0.6/1 kV cables). The dimension of the trenches will vary depending on the number of ducts they contain but would be a maximum of 4m in width and 1.2m in depth.

3.4.45 For string and DC cables, the trench will require a depth 0.85m or less, but can be as wide as 6m near the inverter DC inputs where several cables will converge and be connected to the inverter (up to 20 pairs of DC power cables) as described in **Table 3-2**.

3.4.46 Higher rated cables (likely 33 kV) are required between the transformers and the switchgear and from switchgear to the on-site substations. The dimension of the trenches will vary depending on the number of ducts/cables they contain but would up to 1m in width and up to 1.7m in depth.

3.4.47 Low voltage cables between solar PV panels and the inverters will typically be fixed to the rear of the mounting structure and gathered together at the ends of rows. The grouped cables will then be inserted in underground ducting between racks and the Solar Stations. All other on-site cabling is anticipated to be underground.

3.4.48 Data / fibre optic cables will also be installed, typically alongside electrical cables to allow for monitoring during operation, communications, and the collection of data such as solar data from pyranometers.

Permissive Paths

3.4.49 Incorporated into the Scheme design are two permissive paths, which are illustrated on **Figure 3-1 [EN010142/APP/6.3].** This figure shows the indicative location of these permissive paths only, with the final location being subject to landowner agreement. These permissive paths will provide increased public access across the landscape within an area that has a relatively low density of Public Rights of Way; and thus, respond positively to local Green Infrastructure Strategies and local planning policies relating to rural access and recreational amenity. The paths proposed are:

a. A new permissive path running north-south between Common Lane (east of Hermitage Low Farm) and Northlands Road, providing an off-road link between quiet lanes on the edges of Harpswell and Glentworth and supplementing the proposed direct bridleway between the two villages that is currently going through the Lincolnshire County Council approval process; and

b. A new permissive path also running north-south but further west, linking Common Lane near Billyards Farm and Kexby Road, adjacent to Big Wood.

3.4.50 Both routes incorporate a 25m wide corridor that will allow space for appropriate planting and habitat creation such as hedges and corridors of species-rich grassland. These will screen the solar PV panels and associated infrastructure and offer biodiversity and visual interest to users. The design and implementation of the permissive paths proposed will be secured through a requirement of the **draft DCO [EN010142/APP/3.1]** and in accordance with the **Framework LEMP [EN010142/APP/7.17].**

Surface Water Drainage

3.4.51 The Outline Drainage Strategy (refer to **Appendix 10-4** of this ES **[EN010142/APP/6.2]**) has been informed by the findings of a Flood Risk Assessment (refer to **Appendix 10-3** of this ES **[EN010142/APP/6.2]**) and available online geological mapping. The design will ensure compliance with planning policy with the Scheme draining to greenfield run-off rates and accommodating allowances for climate change. Surface water is proposed to be directed to and captured within swales before discharging to ordinary watercourses (field ditches). Where possible, surface water will drain from the Scheme's swale based drainage system to local receiving watercourses via a new ditch, or the piped section will be shortened and the last 10 m section of the outfall route will be open ditch unless this affects maintenance of the channel by the Internal Drainage Board.

3.4.52 In terms of potential polluted runoff associated with a fire event, the principles of this are outlined within the **FBSMP [EN010142/APP/7.13]**. The FBSMP requires a fire water management plan to be developed including the containment, monitoring and disposal of contaminated fire water where the runoff will be contained and tested/treated before being discharged to local watercourses. It is proposed to contain the fire water runoff within swales surrounding the BESS. The swales will be used for firewater storage as well as surface water storage. The Drainage Strategy has been developed in consultation with the Lead Local Flood Authorities, Internal Drainage Boards and the Environment Agency, as appropriate.

3.4.53 A detailed Drainage Strategy will be designed and implemented in accordance with the Drainage Strategy prior to the commencement of development. Where potential infiltration is proposed, infiltration drainage design will be in accordance with Building Research Establishment (BRE) Digest 365: Soakaway Design (Ref. 3-3). The detailed Drainage Strategy will be secured through a Requirement of the DCO.

3.4.54 The majority of the Scheme falls within Flood Zone 1, with a low probability of flooding from fluvial sources. There are some small areas within Flood

Zones 2 and 3. These fluvial risk locations are in proximity to the River Trent, as a main river, which the Cable Route Corridor crosses, and the River Till and Yawthorpe Beck, which are ordinary watercourses, and which fall within the Principal Site. The Flood Risk Assessment considers these areas of flood risk. Only solar PV panels will be located within Flood Zones 2 and 3, with the more sensitive elements of the Scheme, such as substations, Solar Stations and BESS, to all be located within Flood Zone 1.

3.4.55 **Chapter 10: Water Environment** of this ES **[EN010142/APP/6.1]** provides a description of the flood risk and drainage design and associated figures.

Fencing and Security Lighting (Principal Site and Solar Stations)

3.4.56 A security fence will enclose the PV panel areas of the Principal Site. The fence will be a 'deer fence' type, up to 2.5m in height measured from the ground (refer to **Plate 3-7**). Pole mounted CCTV systems will also be deployed around the perimeter of the operational areas of the Scheme. These would be a maximum of 3m in height. CCTV cameras would have fixed views and will be aligned to face along the fence.

Plate 3-7: Illustrative Image of a Deer fence (Source: AECOM)

3.4.57 The BESS and Solar Stations will be enclosed by metal security fencing that is a maximum of 2.5m in height. This is to comply with British Standard (BS) EN 62271-1:2017 (Ref. 3-2).

3.4.58 During operation, permanent security lights with motion detectors will be used for security purposes around the electrical infrastructure, emergency access points to facilities within the Scheme and potentially at other sites of

critical infrastructure. No areas are proposed to be permanently lit. During overnight maintenance personnel will use portable lighting sources.

Internal Access Tracks

3.4.59 Internal access tracks within the Principal Site will facilitate construction and the operation of the Scheme and are shown indicatively on **Figure 3-1 [EN010142/APP/6.3]**. The majority of these will utilise existing farm tracks, upgrading surfaces as required. The creation of new access tracks will be minimised. The proposed access tracks will be compacted stone tracks up to 4m wide with 1:2 gradient slopes on either side. The four primary access points will be wider, a minimum of 6m to facilitate two-way Heavy Goods Vehicles (HGVs) traffic and passing bays will be provided along internal access roads to ensure traffic does not impact the local highway network. Internal temporary access for construction of on-site substation will be a minimum of 5m in width.

3.4.60 For any new access crossings at the Principal Site, culverts will be avoided wherever possible. However, as a worst-case basis and adopting a precautionary approach, the use of culverts has been considered within **Chapters 6** to **18** of this ES **[EN010142/APP/6.1]** and justification is presented within the relevant technical chapter. However, it is expected that where culverts are necessary, the least impacting design that is reasonably practicable is proposed (e.g. arch rather than box culverts, and box culverts in preference to pipes etc.). The crossings will be sized at detailed design to not impact on flow conveyance, with the culvert inverts will be buried below the natural bed level to allow for natural bed formation and passage of sediments.

Construction Compounds

3.4.61 Five temporary construction compound areas will be located within the Principal Site. These will include compounds for the construction of PV solar infrastructure, on-site substations and the 400kV cable. The construction compounds will contain offices, mobile welfare units, canteens, storage and waste skips, construction staff car parking areas and space for storage, download and turning area. These are illustrated on **Figure 3-14** of this ES **[EN010142/APP/6.3].**

3.4.62 Six construction compound areas will also be required along the Cable Route Corridor to facilitate its construction as shown on **Figure 3-6 [EN010142/APP/6.3]**. These compounds will comprise site offices, storage containers, laydown areas, parking, welfare units and waste sorting areas.

3.4.63 Perimeter fencing for the construction and decommissioning compounds would be up to a maximum of 2.5 metres in height. Security infrastructure including cameras would be up to a maximum of 3m high around the perimeter of compounds.

Solar Farm Control Centre

3.4.64 A Solar Farm Control Centre will be included within the Scheme and will allow between 10- 12 staff to operate and maintain the plant. The Solar Farm Control Centre will consist of:

a. Central Control Room where all operational data of the whole plant will be controlled and monitored;

b. Central CCTV and security control of the whole plant including access gates to fenced areas;

c. Welfare facility for staff and subcontractors;

d. Parking area for staff and visitors; and

e. Own power supply including emergency power supply.

3.4.65 The Solar Farm Control Centre will be a maximum of 20m in length by 15m in width by 6m in height. Ancillary and associated parking and servicing areas to the Solar Farm Control Centre will be located adjacent to the building. The Indicative Principal Site Layout Plan contained in **Figure 3-1** of this ES **[EN010142/APP/6.3]** shows the location for the Solar Farm Control Centre.

3.4.66 Fencing around the Solar Farm Control Centre would be up to a maximum of 2.5 metres in height. Pole mounted internal facing closed CCTV systems up to a maximum of 3m high will be deployed around the perimeter.

Equipment Storage

3.4.67 The Scheme will require spare parts for operation over time. Storage will be provided for spare solar PV panels, trackers, inverters, spare parts for the transformer, switchyard, BESS, CCTV, metrological stations, as well as extra cable reels. This will require an overall site area of approximately 1,200m^2. This area will comprise secure storage containers to store spare parts located adjacent to the Solar Farm Control Centre. Should storage containers be used as an option they will measure a maximum of 12m in length, 2.5m in width and 3m in height. The Scheme would require the provision of a maximum of 40 storage containers for use. Alternatively, an open storage area may be used for some spare parts, such as cable drums and solar panels. The open storage area may be covered by an open-sided 3.2m high canopy for weather protection.

Biodiversity Zones

3.4.68 Biodiversity Zones (BZ) include a range of new habitats that will create, enhance and reinforce green infrastructure across the Principal Site over an area of approximately 233ha, connecting the existing fragmented and isolated habitats, including woodland blocks both within and beyond the Order limits.

3.4.69 These zones will contribute to the delivery of habitat creation and improved ecological networks in line with Central Lincolnshire's Biodiversity Opportunity Mapping. Many of these new habitats will be aimed at supporting ground-nesting birds, including semi-improved or tussock grassland and flower-rich meadows; but will also include linear belts—primarily along field boundaries—where both the number and diversity of native plants will be increased through woodland edge, scrub and hedgerow planting. These areas, alongside natural regeneration, will offer a diverse mosaic of habitats complementing the proposed native woodland. Site-

specific conditions will inform the final choice of habitats and species; for example, wet grassland and ponds will be located within flood zones.

3.4.70 The location of BZ is illustrated on **Figure 3-1: Indicative Principal Site Layout [EN010142/APP/6.3]** and they will be established and maintained in accordance with the **Framework LEMP [EN010142/APP/7.17]**.

Site Accesses

3.4.71 The Principal Site will have four primary points of access for construction, operation, and decommissioning, three located along the A631 Harpswell Lane (Principal Site Accesses 1, 2 and 3) and one located on the B1398 Middle Street (Principal Site Access 4), however Principal Site Access 3 will only be available for the operational phase. There will be six secondary, internal accesses for construction, operation, and decommissioning, four off School Lane and two off Common Lane and two accesses provided for emergency use only during operation, both off Common Lane. Additionally, there are 24 access points for the Cable Route Corridor. See **Figure 3-7 [EN010142/APP/6.3]** and **Table 3-6** for more details.

Table 3-6: Details of Proposed Accesses within Order limits

Access Number	SRoWA[3] Plan [EN010142/APP/2.4] Reference	Location and Description	Phase required		
			Construction	Operation	Decommissioning
Principal Site Access 1	1/13	A631 Harpswell Lane/ School Lane T-junction	✓	✓	✓
Principal Site Access 2	2/03	A631 Harpswell Lane/ Unnamed road leading to Harpswell Low Farm (T-Junction)	✓	✓	✓
Principal Site Access 3	2/09	A631 Harpswell Lane/ Unnamed road leading to Harpswell Grange (T-junction)		✓	
Principal Site Access 4	4/01	B1398 Middle Street / Unnamed road T-Junction (located between Coach road Hill and Harpswell).	✓	✓	✓
Internal Access 1	1/15	Access off School Lane	✓	✓	✓
Internal Access 2	1/14	Access off School Lane	✓	✓	✓
Internal Access 3	5/23	Access off Common Lane	✓	✓	✓
Internal Access 4	6/01	Access off Common Lane	✓	✓	✓
Internal Access 5	1/35	Access off School Lane	✓		✓
Internal Access 6	1/34	Access off School Lane	✓	✓	✓
Emergency Access 1	6/04	Access off Common Lane		✓	

[3] Streets, Rights of Way and Access (SRoWA)

Access Number	SRoWA[3] Plan [EN010142/APP/2.4] Reference	Location and Description	Phase required		
			Construction	Operation	Decommissioning
Emergency Access 2	6/15	Access off Common Lane		✓	
CRC Access 1	24/03	Existing private means of access to be improved	✓	✓	
CRC Access 1B	23/07*	Proposed access via Shortley's Road to enter the proposed cable corridor to the south of Torksey Ferry Road (23/07 and 23/08 to replace existing field accesses, 23/09 a new proposed access).	✓		
	23/08		✓		
	23/09		✓		
CRC Access 2	23/03	Proposed access to be formed in same location as existing field gate access to the north of Torksey Ferry Road.	✓		
CRC Access 3	22/01	Proposed Bellmouth access (asphalt) to be formed off Cottam Road to replace existing field access to facilitate access to cable corridor, trenchless crossing works and joint bays south.	✓		
CRC Access 4	22/02	New Bellmouth access to be formed to the north of Cottam Road to facilitate access to the cable corridor, joint bay, contractors compound and drilling compound / trenchless crossing works to the north.	✓		
CRC Access 5A	21/64	New Bellmouth access to the west of Headstead Bank required to serve the	✓		

Access Number	SRoWA[3] Plan [EN010142/APP/2.4] Reference	Location and Description	Phase required		
			Construction	Operation	Decommissioning
		cable corridor, trenchless crossing and the proposed joint bay works to the west of Overcoat Lane and east of Cow Pastures Lane.			
CRC Access 5B	21/62 & 21/63	Existing unsurfaced Bellmouth to be upgraded to new full asphalt road construction.	✓		
CRC Access 6	20/01	Existing unsurfaced field access / Bellmouth to be upgraded and surfaced with new asphalt road construction.	✓		
CRC Access 7	19/15	New Surfaced Bellmouth to be formed utilising the gap in the existing hedgerow adjacent to the existing allotment boundary.	✓		
CRC Access 8	19/12	New Bellmouth to be formed utilising existing field access location. Existing road construction and type 1 material to be dug out and replaced with new asphalt road construction.	✓		
CRC Access 9	19/04	No existing access is present in this location. New Bellmouth junction (asphalt) to be formed south of A1500 Stow Park Road.	✓		

Access Number	SRoWA[3] Plan [EN010142/APP/2.4] Reference	Location and Description	Phase required		
			Construction	Operation	Decommissioning
CRC Access 10	19/03	No existing access is present in this location. New Bellmouth access to be formed with the A1500 Stow Park Road.	✓		
CRC Access 11	18/01	Access off A class road (A1500) onto farm minor track. Existing farm access junction and access track to be resurfaced and widened as required.	✓		
CRC Access 12A	17/04	Existing Bellmouth to be resurfaced 10.5m back from existing carriageway edge to facilitate construction vehicle access.	✓		
CRC Access 12B	17/25	Existing junction to be widened rebuilt 10.5m back from carriageway edge with local patch repairs beyond this point.	✓		
CRC Access 12C	16/08	New Bellmouth junction to be formed with Wooden Lane to access cable corridor west.	✓		
CRC Access 12D	16/09	New Bellmouth junction to be formed with Wooden Lane to access cable corridor east.	✓		
CRC Access 13	16/06	New access off B1241 Normanby Road.	✓		

Access Number	SRoWA[3] Plan [EN010142/APP/2.4] Reference	Location and Description	Phase required		
			Construction	Operation	Decommissioning
CRC Access 14	16/07	New Bellmouth to be formed off B1241 Normanby Road in behind existing footway in existing road verge / field. Steel protection plates to be placed over footway to protect footway surfacing and existing utilities.	✓		
CRC Access 15	13/32	New Bellmouth access (asphalt) to be construction at the same location as existing field access.	✓		
CRC Access 16A	13/31	New surfaced Bellmouth junction (asphalt) to replace existing stone field access.	✓		
CRC Access 16B	13/26	New surfaced Bellmouth junction (asphalt) to replace existing field access	✓		
CRC Access 17	13/28	New surfaced Bellmouth junction (asphalt) to be formed with Willingham Road.	✓		
CRC Access 18	8/13	New surfaced Bellmouth (asphalt) to be formed off Cow Lane to replace existing field access.	✓		

*The works to this access are permanent however won’t be used by operational vehicles.

3.4.72 The Framework Construction Traffic Management Plan (CTMP) **[EN010142/APP/7.11]** sets out the Applicant's proposals to manage construction traffic and staff vehicles within the vicinity of the Scheme along the local highway network during the construction period of the works, in order to limit any potential disruptions and implications on the wider transport network.

3.4.73 In terms of operational access, activity on-site during the operational phase will be principally routine maintenance, servicing, repairs, replacement of components such as PV Panels and BESS, as well as monitoring to ensure the continued effective operation of the Scheme. For further information see paragraph 3.2.4 and **Table 3-1**.

Highways Works and Road Closures

3.4.74 The following highway works are proposed as part of the Scheme:

a. Within the Order limits:
   i. Street works to facilitate cable installation works;
   ii. Alteration of road layouts, including modifications to road markings and temporary removal of signage to facilitate abnormal load manoeuvres;
   iii. Some private field accesses will be closed, whilst others will be retained and improved, resulting in alterations to road layout to accommodate their connections to local highways;
   iv. Junction improvements at Junction of A631 Harpswell Lane with School Lane, Junction of A1500 Tillbridge Lane with Stow Park Road, and Junction of Stow Park Road with Wooden Lane;
   v. Repair of existing carriageway at Torksey Ferry Road and Wooden Lane;
   vi. Alteration of road layout to facilitate localised carriageway widening for construction vehicles on Fillingham Lane, South Lane, and Wooden Lane;
   vii. Provision of new access points; and
   viii. Construction of passing bays.

b. Off-site:
   i. Implementation of local off-site highway improvements to accommodate abnormal loads travelling to the Principal Site, e.g. pavement protection, temporary removal of street furniture, vegetation clearance including overhanging trees and lifting overheard cables, as required.

3.4.75 Further details of the road works within the Order limits are included on the **Streets, Rights of Way and Access Plans [EN010142/APP/2.4]** and **draft DCO Schedules 4 to 8 [EN010142/APP/3.1]**.

3.4.76 **Table 3-7** summarises roads within the Principal Site and along the Cable Route Corridor which would be undergo temporary single lane or full closure to all traffic, for construction of the Cable Route Corridor, construction of the

accesses and delivery of Abnormal Loads (see Schedule 6 of the **draft DCO [EN010142/APP/3.1]**, **Streets, Rights of Way and Access Plans [EN010142/APP/2.4]** and the **Framework CTMP [EN010142/APP/7.11])**.

Table 3-7: Lane or Road Closures within the Order limits

Local Authority	Road	Closure Type	Indicative Duration
Lincolnshire County Council	A631 Harpswell Lane	Partial	4-6 weeks
	School Lane	Full	6-8 weeks
	Roundabout of A631 Harpswell Lane and B1398 Middle Street	Partial	1-2 days
	B1398 Middle Street	Partial	4-5 weeks
	Common Lane	Full	3-4 weeks (numerous closures of similar or less will be required)
	Cow Lane	Full	4 weeks (numerous closures of similar or less will be required)
	Willingham Road	Full	4-6 weeks
	Fillingham Lane	Full	4 weeks (numerous closures of similar or less will be required)
	South Lane	Full	6 weeks
	Normanby Road	Partial	6-8 weeks
	Wood Lane	Full	6 weeks
	Stow Park Road	Full or Partial	4-5 weeks (full) 8-10 weeks (partial)
	A1500 Tillbridge Lane	Partial	4-5 weeks
	A1500 Stow Park Road	Partial	4-5 weeks

Local Authority	Road	Closure Type	Indicative Duration
	A156 High Street	Partial	6-8 weeks
Nottinghamshire County Council	Headstead Bank & Town Street	Full or Partial	6 weeks (full) 10 weeks (partial)
	Cottam Road	Partial	6-8 weeks
	Torksey Ferry Road	Full	4 weeks
	Nightleys Road	Partial	2-3 weeks
	Shortleys Road	Full	8 weeks (associated with the junction of Torksey Ferry Road and Shortleys Road which will include widening of access over the Seymour Drain).

Public Rights of Way Works

3.4.77 There are 12 Public Rights of Way (PRoW) and three claimed PRoW that cross the Cable Route Corridor, and one PRoW and one claimed PRoW within Principal Site. These PRoW will be impacted during the construction phase of the Scheme, however none of these PRoW will be closed or diverted permanently once the Scheme is operational. During the construction period they will either be diverted locally or will be managed with a banksman (or similar). In addition, a temporary closure of PRoW NT|Rampton|BOAT13 along the Torksey Ferry Road will be required up to an estimated duration of 4 weeks for resurfacing works, with no viable diversion possible.

3.4.78 **Table 3-8** provides a summary of the PRoW within the Order limits and the proposed management approach, as detailed in Schedule 6 of the **draft DCO [EN010142/APP/3.1], Streets, Rights of Way and Access Plans [EN010142/APP/2.4],** the **Framework CTMP [EN010142/APP/7.11]** and the **Framework PRoW Management Plan [EN010142/APP/7.16]**.

Table 3-8: PRoW and Claimed PRoW within the Order limits and proposed management

Local Authority	Public Right of Way	Management Approach
Lincolnshire County Council	Claimed PRoW Kexby and Willingham DMMO 680	Physical separation by fencing or similar, or temporarily diverted
	Claimed PRoW DMMO 591	

Local Authority	Public Right of Way	Management Approach
	Claimed PRoW DMMO 685	
	LL|Bram/66/1	
Nottinghamshire County Council	NT|South Leverton|BOAT 16	
	NT|Cottam|RB4	
	NT|Cottam|FP3	
	NT|Rampton|FP5	
	NT|Rampton|FP6	
	NT|Rampton|BOAT13	
	NT|Rampton|FP20	
	NT|Rampton|BOAT12	
Lincolnshire County Council	Claimed Glentworth and Harpswell Public Bridleway 1209	To remain open and to be managed using a banksman or similar
	Gltw 85/1	
	Claimed PRoW Kexby and Willingham DMMO 680	
	Claimed PRoW DMMO 591	
	Claimed PRoW DMMO 685	
	Mton 68/1	
Nottinghamshire County Council	NT|Cottam|FP1	
	NT|Rampton|BOAT13	
	NT|Rampton|FP20	
	NT|Rampton|BOAT12	
Nottinghamshire County Council	NT|Rampton|BOAT13	Temporary closure with no diversion route available

Sensitive Archaeological Sites

3.4.79 The Principal Site includes 26 areas of SAS, which have been excluded from built development and photovoltaic panels to preserve the archaeological remains. These areas are defined to include a sufficient buffer to avoid construction impacts to the buried archaeological remains or extant earthworks. These areas will be sown with a species-rich grassland mix, in accordance with the **Framework LEMP [EN010142/APP/7.17]**, to create a permanent grass cover and each of the SAS will be demarcated with fencing

to prevent entry and accidental damage during construction, operation and decommissioning of the Scheme.

3.4.80 The location of SAS is shown as Work No 11 on the **Work Plans [EN010142/APP/2.3]** and is illustrated on **Figure 3-1: Indicative Principal Site Layout [EN010142/APP/6.3]**.

3.5 Construction

3.5.1 Subject to the DCO being granted, the earliest construction could start is late 2025, with planned operation in 2028. Operation in 2028 is the earliest date that the Scheme could be connected under the proposed agreement with National Grid.

3.5.2 A **Framework Construction Environmental Management Plan (CEMP) [EN010142/APP/7.8]** has been prepared to accompany this ES. This describes the framework of mitigation measures to be followed and to be carried forward to a detailed CEMP prior to construction. The **Framework CEMP [EN010142/APP/7.8]** will be secured through a Requirement of the DCO.

Principal Site Preparation and Civil Engineering Works

3.5.3 The following activities would be required as part of these works:

a. Preparation of land for construction, including localised site levelling;

b. Import of construction materials, plant and equipment to site to a centralised location within the Principal Site to then be distributed to construction locations;

c. Establishment of the perimeter fence;

d. Establishment of five temporary construction compounds within the Principal Site;

e. Construction of the internal access roads; and

f. Marking out the location of the Scheme infrastructure.

Solar PV Array Construction

3.5.4 The following activities would be required to install the solar PV panels:

a. Import of components to Principal Site to compound areas shown on **Figure 3-6 [EN010142/APP/6.3]**;

b. Piling and erection of mounting structures, with the panel struts/frames rammed/piled to a maximum depth of 4m, or mounting with concrete shoes;

c. Mounting of panels (this will be undertaken by hand);

d. Trenching and installation of electric cabling;

e. Transformer, inverter and switchgear foundation excavation and construction;

f. Installation of transformers, inverters and switchgears (cranes will be used to lift equipment into position); and

g. Installation of control systems, monitoring and communication equipment.

Construction of On-site Electrical Infrastructure

3.5.5 The following activities would be required to construct the on-site electrical infrastructure:

a. Site preparation and civils for the on-site substations;

b. Trenching and installation of electric cabling;

c. Pouring of the concrete foundation base;

d. Import of components to site – cranes will be used to lift the components into position; and

e. Installation of the substations.

Construction of Cable Route

3.5.6 The following activities would be required to construct the cable route:

a. Site preparation including the setting up of temporary storage compounds and loading bays as shown on **Figure 3-6** of this ES **[EN010142/APP/6.3]**.

b. Temporary haul road will be installed in parallel to the cable route alignment. This will require temporary bailey bridges across watercourses. The configuration of the bridging units will be confirmed at detailed design stage. However, it is assumed that the length of the bridge deck would be sufficient to ensure no works within the 10m buffer zone from the watercourse. These would clear the channel, and ensure no construction works within the channel or banks of the watercourses to be crossed. There would be a temporary haul road of impermeable stone to access the temporary bridge crossings.

c. Trenching and installation of electric cabling, including across watercourses will be undertaken. All cables will be installed at a minimum of 3 m below the bed of watercourses, excluding the River Trent and River Till where cables will be installed by trenchless methods at a minimum of 5 m below the lowest surveyed point of the riverbed.

3.5.7 The construction of the Cable Route Corridor will be undertaken in four concurrent phases over the assumed 24-month programme. It is anticipated that each phase would have a dedicated team for the trenched cable element and there would be an additional two teams dedicated to construction of the trenchless crossings. The detailed sequencing will be determined by the principal contractor, once appointed, however, it is anticipated that one team would start at Cottam Substation and one at Substation B within the Principal Site with the other two starting at separate points along the cable corridor. The individual cable route teams will travel to construction compounds within their dedicated works area and therefore, there will be limited overlap of construction traffic along the local highway

network by the four construction teams. The only overlap of team along the local highway network would be where two work areas join. It is anticipated that this would not be for more than 2 months.

3.5.8 It is anticipated that the primary construction activities along the Cable Route Corridor will progress at approximately 100m per day. Cable installation and cable jointing bays will follow behind excavation in the same sequence. The construction compounds are located between 2 and 5km apart along the Cable Route Corridor and therefore any one access would only be utilised for up to 2 months for the primary construction activities, excluding cabling and jointing bays activities. Therefore, impacts for sensitive receptors along the local highway network would only be experienced for a maximum of 2 months as a result of the primary construction activities (excluding cabling and jointing bays).

BESS Construction

3.5.9 The following activities would be required to construct the BESS:

a. Import of components to site;

b. Installation of electric cabling;

c. Construction of foundations; and

d. Installation of batteries.

Testing and Commissioning

3.5.10 Commissioning of the Scheme will include testing and commissioning of the processing equipment including the PV and BESS infrastructure. This will involve mechanical and visual inspection, electrical and equipment testing, and commencement of electricity supply into the grid. The 400kV cable system will require testing and commissioning. For the circuit testing, a mobile transformer will be required at one end of each circuit to carry out the High Voltage power testing. In addition, access to the link box pits situated at the joint bay will be required for the duration of the tests.

Construction Staff

3.5.11 At the peak of construction, which will be around 3 to 6 months after the start of construction, the Principal Site will accommodate a maximum of 1,225 construction staff per day. On average there would be an estimated 812 staff per day.

3.5.12 The Cable Route Corridor will require a maximum of 170 staff per day across the route. Four groups of 30 construction staff will travel to/ from any one of site accesses/ cable contractor compounds per day and two groups of 25 construction staff will travel to/ from any one of the cable route compounds per day.

3.5.13 For the purposes of the ES, 1,395 construction staff per day have been assumed as the maximum peak construction workforce, accounting for concurrent works across the Principal Site and the Cable Route Corridor.

Construction Hours of Work

3.5.14 Core working hours on-site will run from 7am until 7pm Monday to Friday, and 7am to 1pm on Saturday. Construction staff will travel to the site pre-07:00 and depart the site post-19:00 (for weekdays). No construction activities will take place on Bank Holidays and Public Holidays.

3.5.15 Where on-site works are to be conducted outside the core working hours, they will comply with the restrictions stated in the **Framework CEMP [EN010142/APP/7.8]**, and any other restrictions agreed with the relevant planning authorities pursuant to the consent process under section 61 of the Control of Pollution Act 1974 (Ref 3-4). Some works activities may need to occur out of the core hours due to activities requiring to be undertaken continuously (such as trenchless methods) if it is not safe or practical to end it at 19:00 on a particular day.

3.5.16 Measures to control the routing and timing of staff vehicles are set out in the **Framework CTMP [EN010142/APP/7.11]**.

3.5.17 HGV movements will be restricted to certain routes and times of day (outside of the network morning and afternoon peak periods) as outlined within **Appendix 16-2: Transport Assessment** of this ES **[EN010142/APP/6.2]** to reduce the impact on the local high network. In addition, a Delivery Management System will be implemented to control the bookings of HGV deliveries from the start of the construction period. This will be used to regulate the arrival times of HGVs via timed delivery slots, as well as to monitor compliance with HGV routing. The Scheme will also implement a monitoring system to record HGVs travelling to and from the Scheme, to record any non-compliance with the agreed routing plan/delivery hours and to communicate any issues to the relevant suppliers to ensure the correct routes are followed.

Construction Traffic, Plant and Site Access

3.5.18 The main construction and decommissioning access points to the Principal Site will be off the A631, which forms the northern boundary and a single point of access off Middle Street (B1398), with secondary access points off School Lane and Common Lane as identified in **Table 3-6** above. The strategy has been designed to utilise existing accesses.

3.5.19 Construction vehicles would be required to utilise a short section of Common Lane which runs in an east-west direction through the Principal Site to enable the construction of the southern part of the Scheme. Construction traffic will be managed by banksman/banksmen.

3.5.20 The two substations proposed would require the delivery of Abnormal Indivisible Loads (AILs) for the transport of transformers. AILs to the substations would utilise Principal Site Access 1 and 4, only. AILs will also be required for cable drum deliveries along the Cable Route Corridor. The proposed AIL routes are provided within **Figure 16-10** of this ES **[EN010142/APP/6.3]** and AIL Management Plan (Appendix C of the **Framework CTMP [EN010142/APP/7.11]**).

3.5.21 Further detail on assumed AIL routes and accesses are provided in the AIL Management Plan (Appendix C of the **Framework CTMP [EN010142/APP/7.11]**) submitted with the DCO Application.

3.5.22 The peak and average daily number of HGVs and Light Goods Vehicles (LGVs) required for the Principal Site are identified below. To provide a robust assessment, the peak forecast numbers account for daily variation and peak daily movements:

a. Peak – 120 HGV deliveries (240 movements per day) and 60 LGV deliveries (120 movements per day);

b. Average – 65-70 HGV deliveries (130-140 movements per day) and 30-35 LGV deliveries (60-70 movements per day).

3.5.23 The peak and average daily number of HGVs required for the Cable Route Corridor are identified below. To provide a robust assessment, the peak forecast numbers account for daily variation and peak daily movements:

a. Peak – 272 HGV deliveries (544 movements per day); and

b. Average – 186 HGV deliveries (372 movements per day).

3.5.24 Further detail on daily HGV and LGV movements are provided within **Chapter 16: Transport and Access** of this ES **[EN010142/APP/6.1]** and within the **Transport Assessment** in **Appendix 16-2** of this ES **[EN010142/APP/6.2]**.

3.5.25 **Table 3-9** summarises the anticipated plant and machinery required during the construction phase.

Table 3-9: Anticipated Plant and Machinery required for construction

Work Package	Plant / Equipment
Construction of BESS, inverters and transformers	Tracked excavator
	Wheeled loader
	Wheeled mobile telescopic crane
	Dump truck (tipping fill)
	Telescopic handler
	Cement mixer truck (discharging)
PV Panel Construction	Articulated dump truck
	Wheeled mobile telescopic crane
	Diesel generator
	Continuous flight auger piling
	Cement mixer truck (discharging)
	Dumper
Construction of main substation	Tracked excavator
	Lorry
	Telescopic handler

Work Package	Plant / Equipment
	Continuous flight auger piling
	Wheeled mobile crane
	Hand-held welder (welding piles)
	Generator for welding
	Gas cutter (cutting top of pile)
	Mobile telescopic crane
	Lifting platform
	Site lift for workers
	Diesel generator
Cable Installation	Tracked excavator
	Wheeled backhoe loader
	Dumper
	Telescopic handler
	Vibratory roller
Trenchless cable installation	Directional drill (generator)
	Water pump
	Tracked excavator
	Drilling rig

3.5.26 The Scheme will include the provision for a total of 500 car parking spaces based on a peak number of 1,225 construction staff, for works related to the Principal Site. Three separate car parks providing the capped total of 500 car parking spaces for construction staff will be provided and accessed via the two existing accesses available for use during construction and decommissioning on the A631 and via the B1398 (Middle Street). The proposed number of car parking spaces across the three access points will be as follows:

a. Site Access 1: 150 spaces (30%);

b. Site Access 2: 200 spaces (40%); and

c. Site Access 4: 150 spaces (30%).

3.5.27 To ensure the cap on the car parking spaces is not exceeded, a mini-bus/coach service will be provided to pick-up and drop-off construction staff to transport them to/from the site. It is assumed that existing bus stops would be used for the pick-up and drop-off construction staff to/from site. In addition, an average construction staff vehicle occupancy of 1.3 persons per vehicle is assumed for the purposes of this assessment and will be managed by the Contractor. Car sharing will be encouraged to reduce the number of construction staff cars travelling to/from the site.

3.5.28 The construction staff that are working on the Cable Route Corridor will travel directly to the compound closest to the section they are working on, these are distributed across four teams.

3.5.29 The **Framework CTMP [EN010142/APP/7.11]** ensures the proper management of construction related vehicles across the Scheme. This includes:

a. Lift-Sharing;

b. Staff Routeing;

c. Staff Arrival and Departure Times;

d. Car parking strategy and parking permit scheme;

e. Mini-Buses/coaches; and

f. Cap on Vehicle Numbers.

3.5.30 A self-contained wheel wash for the Principal Site will be installed at each access to be used by vehicles prior to exiting the site onto the public highway if there is mud or debris on the construction site. For loads unable to use the fixed wheel wash, a localised wheel washing facility would be set up to cater for these individually and as required to ensure no detrimental effect to the highway.

3.5.31 Further details relating to the distribution and assignment of construction staff vehicle movements and HGV movements on the local highway network is provided within the **Transport Assessment** within **Appendix 16-2** of this ES **[EN010142/APP/6.2]**.

Storage of Construction Plant and Materials

3.5.32 No long-term on-site storage of materials is required during the construction phase. Materials will be delivered via HGVs at regular intervals to the construction compounds and transported directly to where it is required within the site using smaller LGVs.

3.5.33 Short term storage of materials and plant can be accommodated within the construction compound until it is required.

Spoil Management

3.5.34 There will be no site wide reprofiling required; however, there may be a need to level some areas within the Principal Site. This is unlikely to create excess spoil. Limited spoil material would be generated from cable trenches, temporary and permanent compounds, internal roads, BESS and substation compounds, and Solar Stations. During construction, the spoil will be stored temporarily within designated areas adjacent to the cable route and within the construction compounds. The spoil will be utilised to backfill the cable trenches, reinstate the temporary construction compounds and any temporary access roads. Any excess spoil will be utilised across the Scheme.

Construction Lighting

3.5.35 During winter months, mobile lighting towers will be used during construction.

Energy Consumption

3.5.36 An estimated 500m^3 of fuel will be required during construction. Fuel for machinery and generators will be delivered to site by a fuel truck and stored in an above ground fuel storage tank of 10-20m³ capacity. The fuel storage tank will be sheltered, secured from unauthorised access and equipped with a spill protection bund.

Water Consumption

3.5.37 The anticipated need for water during construction would be for use in concrete production, concrete curing, internal road construction works and for construction workers use. It is anticipated that any concrete required for the construction would be obtained from a local batching plant. In addition, it is anticipated that the use of water for concrete curing and internal road construction may not be required where rainfall can be utilised.

3.5.38 During construction, the provision for water supply will be from commercial sources with dedicated clean water tanks provided to supply the various temporary welfare facilities.

Waste

3.5.39 All management of waste will be in accordance with the relevant regulations and waste will be transported by licensed waste hauliers to waste management sites which hold the necessary regulatory authorisation and/or permits for those wastes consigned to them.

3.5.40 The removal of waste from the Scheme has been assessed within **Chapter 16: Transport and Access** and **Chapter 17: Other Environmental Topics** of this ES **[EN010142/APP/6.1]**.

Framework Construction Environmental Management Plan

3.5.41 A **Framework CEMP [EN010142/APP/7.8]** has been prepared to support the DCO Application. This describes the framework of mitigation measures to be followed during construction, to be carried forward to a detailed CEMP prior to construction. The aim of the CEMP is to reduce impacts from:

a. Use of land for temporary laydown areas, accommodation, etc;

b. Noise and vibration;

c. Utilities diversion;

d. Dust generation;

e. Soil removal;

f. Lighting; and

g. Waste generation.

3.5.42 The detailed CEMP will be produced by the Contractor following granting of the DCO and prior to the start of construction (as part of a Requirement attached to the DCO). The CEMP will identify the procedures to be adhered to and managed by the Contractor throughout construction.

3.5.43 Contracts with companies involved in the construction works will incorporate environmental control, health and safety regulations, and current guidance and will ensure that construction activities are sustainable and that all contractors involved with the construction stages are committed to agreed best practice and meet all relevant environmental legislation including (but not limited to): Control of Pollution Act 1974 (COPA) (Ref. 3-4), Environment Act 1995 (Ref. 3-5), Hazardous Waste Regulations 2005 (as amended) (Ref. 3-6) and the Waste (England and Wales) Regulations 2011 (Ref. 3-7).

Landscaping

3.5.44 The Indicative Principal Site Layout Plan (refer to **Figure 3-1** of the ES **[EN010142/APP/6.3]**) sets out the broad location of key components of the Scheme alongside the provision of green infrastructure. This includes proposed areas for planting mitigation, potential areas for ecological enhancement (including habitat connectivity) and the provision of new hedgerows for mitigation. The Indicative Principal Site Layout Plan also shows those areas within the Principal Site where existing woodland and hedgerows will be retained.

3.5.45 Following construction, a programme of site reinstatement and habitat creation will commence. The areas under the solar panels and areas outside the biodiversity areas will be planted with semi improved or species rich grassland where suitable, and hedgerows and woodland will be planted in strategic locations to provide visual screening and to enhance the biodiversity value and connectivity of the site.

3.5.46 Across the Order limits, the following approximate areas will be planted for habitat creation, landscaping and visual screening:

a. Native grassland planting within areas of solar panels, Biodiversity Zones and SAS: over 1,000 ha;

b. Woodland planting: over 40 ha; and

c. New species rich hedgerow planting (length): over 10km.

3.5.47 The Applicant is committed to delivering biodiversity net gain in accordance with the requirements of the **draft DCO [EN010142/APP/3.1].** A **Biodiversity Net Gain (BNG) Report [EN010142/APP/7.14(Rev01)]**, has been prepared to inform the ES and submitted as part of the DCO Application, which demonstrates that on the basis of the illustrative design, the Scheme could achieve a net gain of 64.44% for area-based habitat units, 17.28% for hedgerow units, and 22.94% for watercourse units.

3.5.48 Offsetting provisions have been embedded within the Scheme design for mitigating the loss of arable farmland and providing habitat for ground nesting birds, in particular Sky Lark.

3.5.49 A **Framework LEMP** has been prepared **[EN010142/APP/7.17]** to support the DCO Application. This document sets out the principles for how the land will be managed throughout the operational phase following the completion of construction. A detailed LEMP will be produced following the granting of the DCO and prior to the start of construction (this will be secured by a Requirement attached to the DCO).

3.6 Operational Activities

3.6.1 During the operational phase, activity within the Scheme will be minimal and will be restricted principally to vegetation management, equipment maintenance and servicing, replacement of any components that fail, solar PV panel cleaning and monitoring. It is anticipated that maintenance and servicing would include the inspection and, if required, renewal (refer to **Table 3-1** above) and removal, reconstruction, refurbishment or replacement of faulty or broken equipment. There will also be a requirement once a year for the washing of the solar panels. This will use clean water with no added chemicals, sourced from local potable water suppliers (refer to **Chapter 10: Water Environment** of this ES **[EN010142/APP/6.1]** for further information).

3.6.2 During operation self-contained portable welfare units which store foul/wastewater for collection/emptying by specialist licenced contractors will be deployed on an ad hoc basis (e.g., if required by maintenance crews) at the further reaching sites where the use of the facilities at the Solar Farm Control Centre is not feasible.

3.6.3 The water supply for the Solar Farm Control Centre will come from the mains supply and disposal will be to a cess pit emptied by specialist licenced contractor. Water supply for more extensive operational activities (e.g. panel cleaning) will be delivered to the Principal Site from third party supplies, so as not to put stress on local water supply.

3.6.4 Operational access will be taken from the A631 Harpswell Lane Principal Site accesses via the existing T-Junctions (Principal Site Access 2 and 3), via Principal Site Access 1 on the A631 Harpswell Lane and Principal Site Access 4 on B1398 Middle Street. Access to the Cottam Power Station will be required, at this stage it is anticipated that this will be from Torksey Ferry Road or an alternative access provided by EDF Energy. The majority of routine visits during the operational phase will be via vans and four-wheel drive vehicles. If larger vehicles are required, they are expected to utilise the existing site accesses from the A631.

3.6.5 Along the cable route, operational activity will consist of routine inspections (schedule to be determined) and any reactive maintenance such as where a cable has been damaged.

3.6.6 It is anticipated that there will be up to 10-12 permanent staff on-site during the operational phase. The Scheme is expected to generate a low level of vehicle trips during the operational phase for routine maintenance activities. As a reasonable worst-case, there will be 10-12 staff on-site daily which as a worst-case scenario would generate up to 12 vehicles (24 movements) per day. In addition, there is forecast to be an average of five visits per week (one trip per day) from four-wheel drive vehicles, HGVs or transit vans for

maintenance. If full panel and BESS replacement is required at some point during the lifetime of the Scheme, activity would be considerably less intensive than during construction, and is anticipated to generate approximately 10% of the daily HGV/coach and car/LGV movements estimated to be generated during peak construction of the Principal Site and Cable Route Corridor. Further discussion on operational transport movements is presented in **Chapter 16: Traffic and Transport** of this ES **[EN010142/APP/6.1]**.

3.6.7 The operational life of the Scheme will be 60 years from the point of commissioning of the entirety of the Scheme.

3.6.8 A **Framework Operational Environmental Management Plan (OEMP)** has been produced as part of the DCO Application **[EN010142/APP/7.9]** to demonstrate how any mitigation and management measures will be implemented. It also sets out the monitoring and auditing activities designed to ensure that such mitigation measures are carried out, and that they are effective. In addition, landscaping will be managed in accordance with the **Framework LEMP [EN010142/APP/7.17].** Operational safety risks will be managed in accordance with the **FBSMP [EN010142/APP/7.13].** These plans will be secured by a requirement attached to the DCO.

3.7 Decommissioning

3.7.1 The operational life of the Scheme is 60 years from the date of final commissioning. During this period, the existing agricultural will lay undisturbed beneath the panel infrastructure, enabling it to recover from previous farming and ultimately safeguarding the agricultural usage of this land for future generations.

3.7.2 When the operational phase ends, the Scheme will require decommissioning. All PV panels, mounting poles, on-site cabling, inverters, transformers and concrete foundations to those elements not remaining would be removed from the Principal Site and recycled or disposed of in accordance with good practice and market conditions at that time.

3.7.3 During decommissioning, all infrastructure associated with the Scheme will be removed and recycled or disposed of in accordance with good practice and market conditions at that time. This is with the exception of the cabling in the Cable Route Corridor, which may remain in-situ. The mode of cable decommissioning for the Cable Route Corridor and interconnecting cables will be dependent upon government policy and best practice at that time. Currently, the most environmentally acceptable option is leaving the cables in situ, as this avoids disturbance to overlying land and habitats and to neighbouring communities. Alternatively, the cables can be removed by opening the ground at regular intervals and pulling the cable through to the extraction point, avoiding the need to open up the entire length of the cable route.

3.7.4 In addition, the future of the substations and the Solar Farm Control Centre building would be agreed with the relevant Local Planning Authority prior to commencement of decommissioning. The impact assessment within **Chapters 6 to 18** of this ES **[EN010142/APP/6.1]** has been based on the

worst-case parameters for each technical topic and justification is presented within the relevant technical chapter.

3.7.5 Decommissioning will take between 12 and 24 months in phases. There would be two main phases associated with this; the first phase would remove the above ground structures followed by the second phase for the removal of below ground elements of the Scheme.

3.7.6 The effects of decommissioning are often similar to, or of a lesser magnitude than, construction effects are considered in the **Chapters 6 to 18** of this ES **[EN010142/APP/6.1]**.

3.7.7 A **Framework Decommissioning Environmental Management Plan (DEMP) [EN010142/APP/7.10]** has been produced as part of the ES to demonstrate how the mitigation measures will be implemented. It will also set out the monitoring and auditing activities designed to ensure that such mitigation measures are carried out, and that they are effective. This will be secured by a Requirement within the DCO.

Land Reinstatement

3.7.8 The drainage of the land within the Scheme will be checked and grassed after decommissioning. Should any agricultural drains be altered or removed, they will be restored such that agricultural activities could continue after decommissioning of the Scheme.

3.7.9 Areas of habitat and biodiversity mitigation and enhancement, as well as permissive paths delivered as part of the Scheme would remain up until the land is returned to the previous landowners. Following this, the landowners would choose how the land is to be used and managed.

3.8 References

Ref 3-1 PINS (2018). Planning Inspectorate's Advice Note 9: Using the 'Rochdale Envelope'. https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/

Ref 3-2 British Standard (BS) (2017). BS EN 62271-1:2017 High-voltage switchgear and controlgear. Common specifications for alternating current switchgear and controlgear (IEC 62271-1:2017) (+A1:2021).

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