# BEACON FEN ENERGY PARK

Planning Inspectorate Reference: EN010151

Chapter 2 – Proposed Development
Document Reference: 6.2 ES Volume 1, 6.2.2 Chapter 2
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**The Planning Act 2008**
**The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 - Regulation 5(2)(a)**
**The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017/572) – Regulation 14**

## Quality information

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# 2. Proposed Development

## 2.1 Introduction

2.1.1 Beacon Fen Energy Park Ltd (the 'Applicant') is bringing forward proposals for a new solar and battery storage park on land approximately 6.5 km northeast of Sleaford and 2.5 km north of Heckington, Lincolnshire. The proposals comprise of above ground solar photovoltaic (PV), and Battery Energy Storage System (BESS) infrastructure connected by a cable route of around 13 km length to the National Grid Bicker Fen 400 kV substation ('Bicker Fen substation') (the 'Proposed Development').

2.1.2 The Proposed Development will be located within the DCO Order Limits ('Order Limits') as shown on **Figure 1.2 Site Boundary Plan** (**Document Ref: 6.4 ES Vol.3, 6.4.2**) and comprises the Solar Array Area, the Bespoke Access Corridor and the Cable Route Corridor which are defined as follows:

- **Solar Array Area** - The land within the Order Limits within which the Solar PV and BESS (and their ancillary infrastructure) will be located.
- **Cable Route Corridor** - The land within the Order Limits within which the Cable Route will be located.
- **Cable Route** - The physical development, i.e. the cable itself, to be located within the Cable Route Corridor.
- **Bespoke Access Corridor** - The land within the Order Limits within which the Bespoke Access Road will be located.
- **Bespoke Access Road** - The physical development i.e. the road itself, to be located within the Bespoke Access Corridor.

2.1.3 The project has an anticipated generation capacity of around 400 megawatts (MW), which is enough clean energy to power over 130,000 UK homes. The proposals include the construction of the necessary infrastructure to export the electricity generated into the National Grid.

2.1.4 It is planned that this will be via an underground connection running from the Solar Array Area of the Proposed Development to the nearby Bicker Fen substation. There would be no need to develop a new National Grid substation, however, there will be a need to carry out upgrade and extension works to Bicker Fen substation. Further details on the substation upgrade and extension works are presented in Section 2.13 below.

2.1.5 The Proposed Development will include an onsite BESS. This will allow the electricity generated by the panels to be stored on site at times when grid demand is low, then exported at times of higher demand and also provide an important balancing service for the National Grid. The solar panels and BESS are expected to have an operational lifespan of up to 40 years, after which they would be safely decommissioned and the Solar Array Area returned to agricultural use.

2.1.6 The Proposed Development will also include a new access road from the A17 to the Solar Array Area to facilitate all phases of the Proposed Development

(construction, operation/maintenance and decommissioning). This is termed the Bespoke Access Road.

2.1.7 Junction improvements may be required in the wider area at passing places and haul road crossing points of the public highway, as well as localised widening to facilitate abnormal load access. A priority T-junction arrangement within an existing layby on the A17 is proposed as part of the Bespoke Access Road.

2.1.8 As the Proposed Development would produce over 50MW of electricity, it is classed as a Nationally Significant Infrastructure Project (NSIP) and, therefore, a Development Consent Order (DCO) must be applied for before the Proposed Development can be built.

2.1.9 This chapter provides a description of the Site and its surroundings, the Proposed Development, including the current parameters upon which the technical assessments are based and works at Bicker Fen substation.

## 2.2 The Site and Surroundings

2.2.1 The Site is located east of Sleaford in Lincolnshire and comprises the Solar Array Area, Cable Route Corridor and Bespoke Access Corridor (each as described in more detail below and as illustrated on Figures 1.1 – 1.3). The three areas are collectively known as the 'Order Limits'.

- Figure 1.1 Site Location Plan **(Document Ref: 6.4 ES Vol.3, 6.4.1).**
- Figure 1.2 Site Boundary Plan **(Document Ref: 6.4 ES Vol.3, 6.4.2).**
- Figure 1.3 Site Area Plan **(Document Ref: 6.4 ES Vol.3, 6.4.3).**

### Solar Array Area

2.2.2 The Solar Array Area is approximately 529 hectares (ha) in size and located to the north of Heckington, centred at the National Grid Reference (NGR) 514682 347825. The Solar Array Area is located wholly within the administrative areas of North Kesteven District Council (NKDC) and Lincolnshire County Council (LCC).

2.2.3 The Solar Array Area predominantly comprises agricultural land in arable use, divided by ditches with sparse tree cover that is limited to small woodland blocks and scattered hedgerow trees. A small reservoir is located in the south-west of the Solar Array Area.

2.2.4 The Solar Array Area is bound to the south, west and north by local highways, and bound to the east by the Car Dyke. Public Right of Way (PRoW) Ewer/12/1 extends across the north-eastern corner of the Site, close to the northern Site boundary. There are no other PRoW within the Solar Array Area.

2.2.5 There is a single residential property located to the north-east of the Solar Array Area, which is excluded from the Order Limits. There are a number of individual properties in the surrounding area, and nearby villages to the Solar Array Area include:

- Howell immediately to the south-west, with Heckington c. 1.7km beyond;
- Ewerby Thorpe immediately to the west, with Ewerby c. 1.1km beyond;
- Anwick c. 2.7km to the north-west;
- North Kyme c. 2.4km to the north; and
- South Kyme c. 1.5km to the east.

## Cable Route Corridor

2.2.6 The Cable Route Corridor is approximately 183 ha in size comprising predominantly agricultural land and extends c. 13km south-east from the Solar Array Area to Bicker Fen substation, at NGR TF 19684 38599. The Cable Route Corridor is located wholly within the administrative area of LCC. The majority of the Cable Route Corridor is located within the administrative area of NKDC, however the southern section is located within Boston Borough Council's (BBC) administrative area[1].

2.2.7 The Cable Route Corridor has been refined throughout the design evolution of the Proposed Development, informed by results from environmental surveys and consultation feedback. However, some necessary flexibility has been maintained regarding the exact entry point to the Bicker Fen substation as this will be determined in liaison with National Grid post-consent.

2.2.8 Where the Cable Route Corridor extends immediately south from the Solar Array Area it is located c. 1.2km east of Heckington at the closest point. There are a number of individual properties located immediately adjacent or in close proximity to the Order Limits, on Littleworth Drove and Star Fen Road where they transect the Site. Other nearby villages and hamlets to the Cable Route Corridor, not already listed above against the Solar Array Area, include:

- Great Hale c. 1.6km to the west, with Little Hale and Helpringham beyond;
- East Heckington c. 2.4km to the north-east;
- Swineshead Bridge c. 1.86km to the east;
- Swineshead c. 2.1km to the east (and 0.62km north of an access route to the Cable Route Corridor);
- Bicker Bar c. 2.2km to the south-east; and
- Donington c. 1.5km to the south.

2.2.9 A number of local highways cross the Cable Route Corridor, and the A17 crosses east to west within the north-west section of the Corridor. The railway, linking Heckington west to Sleaford and east to Swineshead, intersects the mid-section of the Corridor. There are a number of PRoW within the Cable Route Corridor, including one alongside the South Forty Foot Drain which also

[1] At the time of Scoping, a section of the cable route search area was located within the administrative area of South Holland District Council ('SHDC'). Since refinement of the cable route (see Chapter 3) there is no longer any part of the Site within SHDC's administrative area.

crosses the Cable Route Corridor. PRoW are discussed further in **Chapter 15: Socio Economics (Document Ref: 6.2 ES Vol.1, 6.2.15).**

### Bespoke Access Corridor

2.2.10 The Bespoke Access Corridor comprises an area of 45.4 ha and it is within this corridor that the Bespoke Access Road will be located. The Bespoke Access Corridor predominantly comprises agricultural land and extends c. 3km south-west from the Solar Array Area to the A17 and is located wholly within the administrative areas of LCC and NKDC.

2.2.11 Where the Bespoke Access Corridor extends south from the Solar Array Area it is located c. 500m south of Ewerby; and where it joins the A17 it is c. 2.1km west of Heckington at the closest point. There are a small number of individual properties located in proximity to the Order Limits, on Asgarby Road and in Boughton and Asgarby. Other villages and towns near to the Bespoke Access Corridor include:

- Kirkby la Thorpe c. 1.2km to the west; and
- Sleaford c. 3km to the west.

2.2.12 Asgarby Road crosses the Bespoke Access Corridor and there are four PRoW located within the corridor. PRoW will only be closed temporarily during construction and managed appropriately during operation. Further information on PRoW is presented in **Chapter 15: Socio Economics (Document Ref: 6.2 ES Vol.1, 6.2.15).**

### Environmental Designations

2.2.13 The Site is located within a Nitrate Vulnerable Zone. There are no other statutory environmental designations within the Order Limits.

2.2.14 The north-east of the Solar Array Area and the mid and southern section of the Cable Route Corridor are located within Flood Zones 2 and 3. Further information is provided within **Chapter 11: Water Resources (Document Ref: 6.2 ES Vol.1, 6.2.11)** and **Appendix 11.1: Flood Risk Assessment (Document Ref: 6.3 ES Vol.2, 6.3.60).**

2.2.15 There are a number of statutory historical designations, including Scheduled Monuments and Listed Buildings, within the nearby villages and hamlets. Further information is provided within **Chapter 8: Cultural Heritage (Document Ref: 6.2 ES Vol.1, 6.2.8).**

2.2.16 There are a number of Local Wildlife Sites (LWS) within the local area, including Great Hale Eau and South Forty Foot Drain which both cross the south-eastern section of the Cable Route Corridor. Further information is provided within **Chapter 7: Ecology (Document Ref: 6.2 ES Vol.1, 6.2.7).**

## 2.3 Design Evolution

2.3.1 The overall design of the Proposed Development layout emerged as a result of an analysis of opportunities and constraints, detailed environmental assessment and consultation with statutory and non-statutory consultees. At this stage, and as set out where relevant below, a number of the detailed

elements of the design of the Proposed Development remain to be confirmed. For such instances, use of design parameters has been incorporated into the assessment to present a likely worst-case assessment of the potential environmental effects. This is in accordance with the Rochdale Envelope Approach which is supported by Advice Note 9[2] (see **Chapter 4: Scope and Methodology (Document Ref: 6.2 ES Vol.1, 6.2.4)** for further details).

2.3.2 Since the submission of the Preliminary Environmental Information Report (PEIR), the Proposed Development design has been refined in response to consultation feedback, on-going environmental surveys and subsequent appraisal work. The Proposed Development layout is illustrated at **Figure 1.3 Site Area Plan (Document Ref: 6.4 ES Vol.3, 6.4.3)**. The **Works Plan (Document Ref: 2.4)** shows the areas in which the various components of the Proposed Development may be constructed in line with the parameters identified in Section 2.4 below. Where flexibility has been retained, the ES assesses the likely significant effects of the relevant maximum extent parameter to ensure a conservative 'worst-case' assessment has been carried out.

2.3.3 The environmental mitigation that has been embedded into the design of the Proposed Development is summarised in **Appendix 2.3**: **Embedded Mitigation (Document Ref: 6.3 ES Vol.2, 6.3.6)** and discussed in detail in the respective discipline specific chapters. These measures are referred to as ‘embedded mitigation’ because they form part of the design that has been assessed in this ES and are secured as part of the parameters and design principles secured through the **Draft DCO (Document Ref: 3.1)**, as shown on the **Works Plan (Document Ref: 2.4)**.

2.3.4 The Outline Design Principles are set out within the **Design and Access Approach Document (Document Ref: 5.6)** and are structured to reflect the description of the Proposed Development, as set out in Schedule 1 of the **Draft DCO (Document Ref: 3.1)** (and shown on the **Works Plans (Document Ref: 2.4)**). The Outline Design Principles include a series of commitments that will control the detailed design and provide guidance on aspects of the intended form and scale of the principal components of the Proposed Development and reflect the design parameters described in Table 2.1 below. Together, the **Works Plan (Document Ref: 2.4)** and the Outline Design Principles establish the three-dimensional envelope for the Proposed Development to be built and operated, secured through the **Draft DCO (Document Ref: 3.1)**.

2.3.5 **Figure 1.4 Indicative Site Layout Plan (Document Ref: 6.4 ES Vol.3, 6.4.4)** provides an illustration of how the Site could be developed, in accordance with the parameters identified within Section 2.4 below and the **Works Plan (Document Ref: 2.4)**.

## 2.4 Design Parameters

2.4.1 The principal operational components of the Proposed Development are:

- Solar Arrays;
- Power Conversion Units;

[2] Planning Inspectorate Advice Note 9: Rochdale Envelope (July 2018; Version 3)

    - Inverters;
    - Transformers;
- Battery Energy Storage System (BESS);
- Onsite Substation;
- Onsite Cabling;
- Fencing;
- Water supply and drainage infrastructure;
- Cable Route; and
- Bespoke Access Road.

2.4.2 The parameters that have been set for each of the above components and other relevant matters are discussed below and set out in Table 2.1. These parameters reflect the anticipated maximum dimensions of the specified equipment and relevant components.

2.4.3 The assessments within this ES are based upon these parameters. Wherever flexibility is maintained in the design parameters, the maximum extent has been used to ensure the likely worst-case impacts are reported in this ES.

2.4.4 Along with the above main components, the Proposed Development will include the following:

- Access tracks of between 3.5m to 9m width for construction access and routine maintenance when the Proposed Development is operational. Access tracks located adjacent to drainage ditches will incorporate the necessary ecological; Environment Agency (EA) and/or Internal Drainage Board (IDB) buffers where required;
- Boundary treatments, means of enclosure, security measures, and paths;
- Landscaping and reinstatement planting and Biodiversity Net Gain related habitats;
- Flood resilience measures including swales and storm water attenuation, and works to existing irrigation systems;
- Utility diversions;
- Bunds, embankments, protective works to buildings, maintenance and improvement of streets; and
- Construction related (and decommissioning related) work sites.

**Table 2.1 – Design Parameters**

| COMPONENT | PARAMETER |
|---|---|
| **SOLAR ARRAY AREA PARAMETERS** | |
| **Solar Arrays** | **Maximum height of arrays will be**:<br>• 3.9m above ground level in fields in the east; and<br>• 3.5m above ground level in fields towards the west, south and an isolated field in the north.<br>See **Figure 2.4 Panel Heights (Document Ref: 6.4 ES Vol.3, 6.4.5)** for distribution across the Solar Array Area. |
| | **Maximum panel dimensions**: 2.5m long and 1.5m wide |
| | **Panel orientation**: Fixed / static, facing due south and tilt angled 10° to 45° from horizontal. |
| | Module frame to be built from anodised aluminium or steel. |
| | Tables will be supported by galvanized steel poles, driven approximately 1.0m to 2.5m into the ground. |
| **Inverters** | Type: String **or** Central, dependent on worst case for the relevant environmental assessment. |
| | **String**<br>A single string inverter unit could be utilised for up to every 32 (array) strings, with the string inverters small enough to be mounted underneath the modules. |
| | **Central**<br>• The central inverters are larger and require their own electrical cabinet enclosures, but there would be fewer required.<br>• Central inverters would be located at regular intervals amongst the PV arrays, occupying an area (anticipated to be approximately 12m x 3m and up to 3.5m in height) that would be reliant upon the intervals.<br>Two options for the central inverters, if they are to be used, are currently being considered:<br>• **Outdoor equipment**: Placing the equipment (i.e., inverter, transformer and switchgear) outdoors and independent from each other, with an approximate footprint of up to 40m$^2$ and a height of up to 3.5m.<br>• **Indoor (i.e. enclosed) equipment**: Placing the equipment within a purpose-built enclosure similar to a 40-foot ISO High Cube Container, with an approximate footprint of up to 40m$^2$ and a maximum height of up to 3.5m. |
| **Transformers** | **MV Transformer (800V up to 33kV)**<br>• **Weight**: c. 18 tonnes per unit (central inverter plus the transformer).<br>• **Footprint**:<br>  ○ **Outdoor:** transformer footprint of up to 6m x 3.5m and height of up to 3.5m; or<br>  ○ **Indoor (i.e. enclosed):** installed within a container with a footprint of up to 7m x 3.5m and height of up to 3.5m. |

| COMPONENT | PARAMETER |
|---|---|
| | **4x High Voltage (HV) Transformers (33kv up to 400kv)**<br>• **Weight**: 160 tonnes per unit.<br>• **Footprint**: up to 15m x 9.5m and height of up to 10.5m. |
| | **Main Unit transport size**: L x W x H: 8.35m x 3.885m x 4.625m. |
| **Switchgear** | The switchgear may be an individual standalone unit within its own enclosure or may be pre-assembled with transformers and inverters to form a single contained unit. |
| | Maximum footprint of 3m x 3.5m and up to 3.5m in height. |
| **Power Conversion Units** | A Power Conversion Unit (PCU) comprises an inverter, a transformer, and switchgear, which can be grouped together or distributed throughout the Solar Array Area.<br>If grouped together: maximum dimensions 16m x 3.5m and up to 3.5m.<br>The different types of inverters and transformers considered for the Proposed Development are outlined above and whether indoor or outdoor equipment is utilised can be termed an 'Indoor Solar Station' or an Outdoor Solar Station'. |
| **Battery Energy Storage System (BESS)** | Batteries to be placed within individual enclosures, arranged regularly within a compound with vehicular access available to each unit. Final number dependent upon power capacity and duration of energy storage. |
| | **BESS container dimensions**: up to 8m x 3m, with a height of up to 4.5m. |
| | Total size and distribution of BESS across Site will be reliant on grid conditions at the time of construction design. |
| | AC coupled single compound. |
| **Firewater Storage Tank(s)** | The number of aerial rigid tanks are to be determined as part of detailed design; however, this is likely to either be two 120m$^3$ tanks **or** four 60m$^3$ tanks with a total capacity of 240m$^3$. |
| | **Maximum dimensions**: L x Diameter x H: 18m x 3m x 3.5m |
| **Rainwater Harvesting Tank(s)** | Rainwater harvesting will be used where feasible. This will be confirmed as part of detailed design. |
| **Reservoir** | The reservoir located at National Grid Reference: TF 14404 47190 will be retained for irrigation of onsite habitats and will be available to first responders. The reservoir has a volume of approximately 27,276 cubic metres. |
| **Onsite Substation** | The shape of the Onsite Substation will be defined as part of detailed design and will not exceed an area of **40,000m$^2$**. The footprint of the single onsite substation compound is likely to take the form of either a rectangle **or** a square with the following dimensions:<br>• **Rectangle:** up to 250m x 160m and a height of up to 13m; or<br>• **Square:** up to 200m x 200m and a height of up to |

| COMPONENT | PARAMETER |
|---|---|
| | 13m. |
| | The Onsite Substation would have up to 4 HV transformers and is expected to include a control building, office space, welfare facilities, a 33kV switchroom as well as operational monitoring and maintenance equipment and equipment for reactive compensation and/or harmonic filtering. The design control building and office/welfare will be defined as part of detailed design. |
| **Onsite Cabling (within Solar Array Area)** | Low voltage electrical cabling required to connect PV modules and BESS to inverters (typically via 1.0/1.5kV DC cables), and inverters to the onsite transformers (typically via 0.4/1kV AC cables).<br>• **Indicative dimension of cable trenches**: up to 1.2m in width and between 0.8m and 1.6m in depth (in limited locations, the depths can be increased to 2.5m or over to account for local anomalies). |
| | Higher voltage cables (typically 33kV) required between transformers and switchgear and from switchgear to the substations.<br>• **Indicative dimension of cable trenches**: up to 1.2m in width and up to 1.6m in depth (in limited locations, the depths can be increased to 2.5m or over to account for local anomalies). |
| | Higher voltage cables to share trenches with lower voltage cables on the same route, where possible. |
| | Onsite cabling between PV modules and inverters anticipated to be above ground level, placed along row of racks fixed to mounting structure, placed underground, between racks and inverter. All other onsite cabling to be underground wherever possible. |
| | Data cables to be installed to allow monitoring during operation. |
| **Fencing and Security** | **Perimeter fence:** up to 3m high consisting of post and wire deer fencing.<br>Pole mounted internal-facing closed circuit television (CCTV) systems to be deployed around perimeter of the operational Solar Array Area of the Site; anticipated to be 5m high. |
| | **Acoustic fence:** If required around the BESS infrastructure this would be up to 4m high. |
| | **Security fence:** This would be installed around substation compounds and other electrical infrastructure / compounds.<br>• Security fence to be up to 3.4m high.<br>• 0.35m concrete beam below ground. |
| **Lighting** | Motion detection security lighting will be used along with infrared lighting provided by the CCTV security system. Lighting at the BESS and Onsite Substation will be passive infrared (PIR) operated, calibrated to detect vehicles and personnel. All visible lighting will be 50W, installed at a |

| COMPONENT | PARAMETER |
|---|---|
| | maximum height of 4m with downward light fittings to prevent light spillage. |
| **CABLE ROUTE CORRIDOR PARAMETERS** | |
| **Cable Route** | • Underground cabling is the adopted standard and proposed option.<br>• Standard trenching will be primarily utilised for crossings including methods such as open-cut and cofferdam.<br>• Trenchless techniques, such as auger boring, horizontal directional drilling (HDD) or micro-tunnelling will be undertaken where environmental assessment determines that mitigation for an environmental impact is required or design constraints concludes the need for an alternative to open trenching. |
| | **Length**: Approximately 13km (from Solar Array Area to Bicker Fen Substation) |
| | **Working width during construction**: 30m |
| | • **Open-cut trench excavation dimensions**: Approximately 2m wide x 2.5m depth excavated for each cable subject to design and ground conditions.<br>• **Trenchless techniques maximum depth:** Up to 25m depth subject to design and ground conditions. |
| **BESPOKE ACCESS ROAD PARAMETERS** | |
| **Bespoke Access Road** | A Bespoke Access Road from the A17 to the Solar Array Area, comprising a 6m wide carriageway, will be provided to facilitate the construction, operation/maintenance and decommissioning phases of the Proposed Development. The carriageway will be widened on some bends to a width of 8m, to allow for the passage of abnormal loads, and for two way Heavy Goods Vehicle (HGV) traffic. Additionally, overrun areas will be provided where necessary for abnormal loads.<br>The soil associated with the reprofiling required to construct the road will be stored as required in accordance with good practice guidance alongside the Bespoke Access Road. |
| | **Length**: Approximately 3.2km (from A17 to the Site) |
| | **Working width during construction:** 50m |
| **Fencing and Security** | Fencing will be required along the boundary of the working area during construction and gates will be installed at the entry points to prevent unauthorised access. However, this is subject to detailed design. Gates will also be present where the road crosses Asgarby Road and Heckington Road. |
| **GENERAL PROPOSED DEVELOPMENT PARAMETERS** | |
| **Construction Traffic** | The Annual Average Daily Traffic (AADT) and the Annual Average Weekly Traffic (AAWT) for the full and peak construction periods are presented below and there will be |

| COMPONENT | PARAMETER |
|---|---|
| | material daily variation over that period. Construction traffic predictions and routing are discussed further in **Chapter 9: Access and Traffic (Document Ref: 6.2 ES Vol.1, 6.2.9).** |

| | Full Construction Period | | Peak Construction (12months: Aug 2027 to Jul 2028) | | Peak Month (October 2027) |
|---|---|---|---|---|---|
| | AADT | AAWT | AADT | AAWT | Average Daily Flow (two-way) |
| **Car** | 116 | 163 | 219 | 307 | 332 |
| **Minibus** | 11 | 16 | 21 | 30 | 32 |
| **LGV** | 5 | 7 | 3 | 5 | 15 |
| **HGV** | 36 | 51 | 58 | 82 | 130 |
| **Total** | 168 | 236 | 302 | 424 | 509 |

**Phasing**

**Construction:**

The rate of construction will be dependent on environmental and market factors. However, construction is anticipated to commence in 2027 and last for 2.5 to 5 years in total. The Bespoke Access Road and Cable Route can commence construction at the same time and are anticipated to last between:

- Bespoke Access Road: 6 to 12 months
- Cable Route: 12 to 24 months

All material construction on the Solar Array Area will follow the completion of the Bespoke Access Road and last between 24 to 36 months. Some limited preparatory works may be carried out on the Solar Array Area simultaneously to the construction of the Bespoke Access Road.

Construction of the Bicker Fen substation extension will be undertaken separately by National Grid and is anticipated to last 60 weeks.

**Operation:**

The Bespoke Access Road will become operational during the construction phase of the Solar Array Area and Cable Route and will remain in operation through the decommissioning phase.

- Bespoke Access Road: ~45 years
- Solar Array Area and Cable Route: ~40 years

**Decommissioning:**

The decommissioning phase of the Proposed Development is anticipated to last between 12 to 36 months. This is variable depending on landowner requirements.

- **Solar Array Area**:
  - All relevant principal equipment located within the Proposed Development will be removed and recycled or disposed of in accordance with good practice and market conditions at the time.
  - This includes removing all solar PV array infrastructure including modules, mounting structures, inverters, transformers,

| COMPONENT | PARAMETER |
|---|---|
| | switchgear, the Onsite Substation, BESS, fencing and ancillary infrastructure. All waste will be disposed of in accordance with the legislation at the time of decommissioning.<br>○ Foundations and other below ground infrastructure, which are not practicable to remove, will be cut below the surface to enable future ploughing. Any piles would be removed.<br>○ Buried medium voltage cables would either be removed and land restored or remain in situ. Each environmental assessment considers the option which represents the worst-case scenario, relevant to the topic under consideration.<br>• **Cable Route**:<br>○ The 400kv cable will remain in situ.<br>• **Bespoke Access Road**:<br>○ The Bespoke Access Road is presently assumed to be removed during decommissioning. The road will likely be the last aspect to be removed as it will be used to facilitate decommissioning of the Solar Array Area. Whilst it is assumed that the road will be removed, it is possible that engagement with the landowners at that time will establish a preference for it to be retained. Optionality has been deliberately retained in the Application to facilitate such a scenario. For the purposes of this ES, each topic (unless otherwise stated within the chapter) has assumed the removal of the road on the basis that this will, at the time of decommissioning, have a greater potential impact than retention, so allowing for a conservative assessment of the potential significant effects.<br>• **Bicker Fen Substation**:<br>○ The works undertaken at the Bicker Fen substation will remain in situ. |

## 2.5 Solar Arrays

2.5.1 Solar PV modules convert sunlight into electrical current (as Direct Current (DC)) by absorbing the sun's energy and generating a flow of electricity. Figure 2.1 below shows an example solar array.

**Figure 2.1 Solar panels with south facing configuration**

2.5.2 The height of the arrays has been informed through iterative design considering flood modelling data resulting in a height of up to 3.9m above ground level in fields to the east and up to 3.5m above ground level in fields towards the west, south and an isolated field to the north as shown on **Figure 2.4 Panel Heights (Document Ref: 6.4 ES Vol.3, 6.4.4).**

2.5.3 The individual panels are anticipated to be up to 2.5m long and up to 1.5m wide and consist of a series of PV cells beneath a layer of toughened glass. The proposal is for a fixed (i.e., static) panel orientation, facing due south (i.e., 180° azimuth) which is commonly seen on existing UK solar farms, and angled 10° to 45° from horizontal. Solar PV technology is developing rapidly, and alternatives may be available at the time of construction. However, it is considered that the above parameters allow for a realistic and robust assessment of potential environmental effects.

2.5.4 Each module would have a DC generating capacity of between 600 and 850 watts (W) or more depending upon any advances in solar PV technology at the time of construction.

2.5.5 The exact number of PV panels that would be used in the Proposed Development is not yet known. Various factors will help to inform the number and arrangement, and it is likely that some flexibility will be required to accommodate future technological developments.

2.5.6 The modules are to be fixed to a mounting structure in groups, known as ‘strings’. Each string of modules will be mounted on a metal framing system, known as ‘tables’. The module frame is anticipated to be built from anodised aluminium or steel for durability. The tables are usually supported by galvanized steel poles, driven approximately 1.0m to 2.5m into the ground.

# 2.6 Supporting Infrastructure (Inverters, Transformers, and Switchgear)

## Power Conversion Units

2.6.1 A Power Conversion Unit (PCU) comprises the inverter, transformer, and switchgear. If grouped together, this would comprise an area of up to 16m x 3.5m with a height of 3.5m.

2.6.2 The different types of inverters and transformers considered for the Proposed Development are outlined below. This supporting infrastructure could be located separately as an “Outdoor Solar Station” or enclosed within a single container, referred to as “Indoor Solar Station”.

## Inverters

2.6.3 Inverters convert the direct current (DC) produced by the solar PV modules into alternating current (AC) which is used by the National Grid. An example string inverter is shown on Figure 2.2 below.

**Figure 2.2 Typical String Inverter (image reproduced courtesy of Huawei)**

2.6.4 It is anticipated that either a string inverter or central inverters would be used onsite. Within this ES, each environmental topic assessment has considered the option which represents the worst-case scenario, relevant to the topic under consideration.

2.6.5 A single string inverter unit could be utilised for every circa 32 (array) strings, with the string inverters small enough to be mounted underneath the modules.

2.6.6 The central inverters are larger and require their own electrical cabinet enclosures, but there would be fewer required. Central inverters would be located at regular intervals amongst the PV arrays, occupying an area (anticipated to be approximately 12m x 3m and up to 3.5m in height) that would be reliant upon the intervals.

2.6.7 Two options for the central inverters, if to be used, are currently being considered.

- The first option is for outdoor equipment as part of an Outdoor Solar Station. This would entail placing the equipment (i.e. inverter, transformer and switchgear) outdoors and independent from each other, with an approximate footprint of up to 40m$^2$ and a height of up to 3.5m.
- The second option is for is for indoor (i.e. enclosed) equipment as part of an Indoor Solar Station. This would entail placing the equipment within a purpose built enclosure similar to a 40-foot ISO High Cube Container, with an approximate footprint of up to 40m$^2$ and a maximum height of up to 3.5m.

## Transformers

2.6.8 Transformers are required to 'step-up' the voltage of the electricity generated to a higher voltage prior to it reaching the Onsite Substation (see Section 2.8 for further details on the Onsite Substation). The transformer stations would likely be located at regular intervals across the Site.

2.6.9 Similar to the inverters, two options are currently being considered for the transformers; outdoor or indoor.

2.6.10 The outdoor transformers would have a footprint of up to 6m x 3.5m and a height of up to 3.5m. The indoor (i.e., installed within a cabin with indoor switchgear) transformers would have a footprint of up to 7m x 3.5m and with a height of up to 3.5m. The cabins would likely be located at regular intervals across the Site.

2.6.11 The transformer station would be externally finished in keeping with the prevailing surrounding environment, often with a green painted finish. Alternatively, as described above, transformers can be installed in a High Cube Container together with an inverter and switchgear as part of an indoor solar station.


**Figure 2.3 Typical transformer cabin (including switchgear) (Image reproduced courtesy of Selma)**

### Switchgear

2.6.12 Switchgear are the combination of electrical disconnector switches, fuses or circuit breakers used to control, protect and isolate electrical equipment. Switchgear is used both to de-energise equipment to allow work to be done and to clear faults downstream.

2.6.13 Switchgear has a typical footprint of 3m x 3.5m and up to 3.5m in height. Switchgear can be also located in a cabin together with the transformer and inverter.

## 2.7 Battery Energy Storage System

2.7.1 The Proposed Development will include an associated 600MW battery energy storage system (BESS). The BESS area is located adjacent to the proposed Onsite Substation as shown on **Document Ref. 2.6 Illustrative Layout Plan of Battery Energy Storage System and On-Site Substation**. Within the BESS area, this ES considers provision of the BESS infrastructure as described below as well as the provision of PV panels in the area in the event that not all of the BESS is built out, with each discipline assessing the worst case scenario as applicable to each environmental topic.

2.7.2 BESS is used to store electricity as chemical energy during periods of surplus electricity generation by the solar PV modules and export it to the grid during periods when electricity demand exceeds generation.

2.7.3 Batteries will be placed within individual enclosures arranged regularly within a compound with vehicular access available to each unit. The precise number will depend upon the level of power capacity and duration of energy storage that the Proposed Development will require. An element of flexibility in approach is, therefore, adopted at this stage as technology, business models and relevant policy all evolve.

2.7.4 The location of the BESS, transformers and dedicated switchgear is determined in part by the BESS being AC-coupled; thereby requiring that they be housed within compounds (rather than distributed around the site next to central inverters).

2.7.5 The dimensions of the BESS containers (and switch rooms) are anticipated to be approximately up to 8m x 3m, with a height of up to 4.5m.

### Fire Safety

2.7.6 The main potential hazard of BESS failure is thermal runaway and, if not controlled, fire. Consultation with Lincolnshire Fire & Rescue service and relevant legislation has influenced the overall Proposed Development design to ensure adequate siting of BESS and grid infrastructure away from sensitive receptors. Battery manufacturers undertake extensive testing and analysis to assess fire risk, and the Proposed Development will adhere to all manufacturer safety recommendations.

2.7.7 An Outline Battery Storage Safety Management Plan (OBSMP) **(Document Ref: 7.2, Outline Battery Safety Management Plan)** is included as part of the DCO application, which incorporates the following safety measures:

- Adequate supplies of water at the Site;
- Installation of systems to detect and suppress fire;
- Adequate separation and ground covering between battery stations to ensure that an isolated fire would not spread and lead to a major incident;
- Roads of adequate width and construction to allow easy access;
- Two routes to the BESS allowing an alternative access where required;
- Visual warning system; and
- Maintenance of vegetation to prevent wildfire risk.

2.7.8 The above safety measures have been considered within the ES as appropriate.

## 2.8 Onsite Substation

2.8.1 A new Onsite Substation will be centrally located and will include transformers, switchgear, metering equipment and all associated equipment required to facilitate the export of electricity to the National Grid.

2.8.2 The Onsite Substation will include control and storage buildings that would house office space and welfare facilities, as well as operational monitoring and maintenance equipment.

2.8.3 The Onsite Substation will have up to four HV transformers and would have a maximum footprint of no more than 40,000m$^2$ (e.g. up to 250m x 160m and a height of up to 13m; or 200m x 200m and a height of up to 13m).

2.8.4 The Onsite Substation will be connected to the PV modules and BESS via Medium Voltage Distribution Cables in order to collect electricity (at 33kV) from those components of the Site. The Onsite Substation will convert the electricity to 400 kV for onward transmission to Bicker Fen substation via Cable Route within the Cable Route Corridor.

## 2.9 Onsite Cabling

2.9.1 Low voltage onsite electrical cabling is required to connect the PV modules and BESS to the inverters (typically via 1.0/1.5kV cables), and the inverters to the onsite transformers (typically via 0.4/1.0kV cables). The dimension of the trenches for this cabling will vary depending upon the number of circuits they contain but would typically be up to 1.2m in width and between 0.8m to 1.6m in depth.

2.9.2 Higher voltage cables (typically 33kV) are required between the transformers and the switchgear and from switchgear to the Onsite Substation. The dimensions of the trenches for this cabling will vary depending on the number of circuits they contain but are anticipated to be approximately up to 1.2m in width and up to 1.6m in depth.

2.9.3 In limited locations, for both low and higher voltage cables, the depths of the trenches can be increased to 2.5m or deeper to account for local anomalies.

2.9.4 Where possible, the higher voltage cables will share trenches with the lower voltage cables on the same route.

2.9.5 Onsite cabling between PV modules and inverters is anticipated to be above ground level along the mounting structure to either a combiner box if a central inverter is used or directly to string inverter, if that option is chosen. These cables are typically installed on the tables but may be buried in ducts between the table rows. All other onsite cabling will be underground where possible.

2.9.6 Data cables will also be installed to allow operational monitoring.

## 2.10 Fencing and Lighting

2.10.1 The perimeter fence would likely comprise a standard post and wire deer fencing up to 3m tall around the Solar Array Area. Security fencing up to 3.4m will be installed around the Onsite Substation compound and, possibly, other infrastructure / compounds. Acoustic fencing, up to 4m tall, may be required around the BESS, subject to the detailed design and layout.

2.10.2 Mounted internal-facing closed circuit television (CCTV) systems will likely be deployed around the perimeter of the operational areas of the Site; anticipated to be 5m high. The CCTV cameras would have fixed view sheds and will be aligned to face along the fence.

2.10.3 Motion detection security lighting will be used along with infrared lighting provided by the CCTV security system to provide night vision functionality for CCTV. No visible lighting will be utilised at the site perimeter fence.

2.10.4 Lighting at the BESS and Onsite Substation will be passive infrared (PIR) operated, calibrated to detect vehicles and personnel. Lighting at the BESS

entrances and adjacent to the access track within the BESS will be operated by PIR calibrated to trigger on vehicle and personnel, with the option of manual control.

2.10.5 All visible lighting will be 50W, installed at a maximum height of 3.4m with downward light fittings to prevent light spillage. External lighting will be located at building entrances and to cover the parking and refuge areas. These will be PIR operated calibrated to vehicles and personnel.

## 2.11 Cable Route

2.11.1 The Proposed Development will be connected to the National Grid at the Bicker Fen substation. Further details on the connection are set out in Section 2.13 below.

2.11.2 The Cable Route Corridor has been refined since the PEIR, informed by environmental surveys and technical assessments to ensure a suitable and viable route to the Bicker Fen substation. **Chapter 3: Alternatives and Design Evolution (Document Ref: 6.2 ES Vol.1, 6.2.3)** provides details on the corridor reduction.

2.11.3 The route extends southwards from the Solar Array Area, crossing Head Dike and Littleworth Drove before turning to the east and then continuing south across the A17 towards Great Hale Fen. The route continues in a broadly south-easterly direction crossing Great Hale Eau and South Forty Foot Drain before reaching the Bicker Fen substation located on Vicarage Drove.

2.11.4 The use of underground cabling is the adopted standard for the solar industry and is the Applicant's proposed option for the Proposed Development. The underground cabling will be installed predominantly via standard open-cut trenched methods, however, where required, trenchless methods for the crossing of existing infrastructure features will be explored such as Horizontal Directional Drilling (HDD). The working area will include mobile equipment, haul road and soil stores. Further detail regarding the construction of the cable route is available in **Appendix 2.1: Grid Connection Construction Method Statement (Document Ref: 6.3 ES Vol. 2, 6.3.4).**

2.11.5 During construction, temporary construction compounds will be required approximately every 1-3 km, as well as temporary roadways, to enable access to all land. It is anticipated that there will be six main compounds that are distributed at approximately equal distances along the cable route to facilitate proper construction management. Smaller temporary compounds may also be located anywhere within the final working area.

2.11.6 Vegetation and hedgerows lost during the construction of the Cable Route will be re-instated where possible in relation to easement restrictions.

## 2.12 Access

### Bespoke Access Road

2.12.1 The primary means of access to the Site will be via the Bespoke Access Road from the A17 and will facilitate all phases of the Proposed Development (construction, operation/maintenance and decommissioning). This will

comprise a priority T-junction from the existing layby to the south-west of Asgarby with a 6.0m wide carriageway. Further details on the Bespoke Access Road are provided in **Chapter 9: Access and Traffic (Document Ref: 6.2 ES Vol.1, 6.2.9),** and **Appendix 9.1: Transport Assessment (Document Ref: 6.3 ES Vol.2, 6.3.54).**

2.12.2 The Bespoke Access Road will be constructed in advance of material construction commencing on the Solar Array Area and will facilitate construction in that area. Further detail regarding the construction of the Bespoke Access Road is available in **Appendix 2.2: Bespoke Access Road Construction Method Statement (Document Ref: 6.3 ES Vol.2, 6.3.5)**. During construction, temporary construction compounds will be required, as well as temporary roadways, to enable access to all the land within the Solar Array Area.

2.12.3 During operation, secondary access to the Site will be provided from Halfpenny Toll Lane near Catchwater Drain along the northern boundary of the Site, approximately 60m east of the junction with Thorpe Road and Howell Fen Drove.

2.12.4 The road will likely be the last component of the Proposed Development to be removed as it will be used to facilitate decommissioning of the Solar Array Area. Whilst it is assumed for this assessment that the road will be removed, it is possible that engagement with the landowners at that time will establish a preference for it to be retained. Optionality has been deliberately retained in the Application to facilitate such a scenario. For the purposes of this ES, each topic has assumed the removal of the road (unless otherwise stated in the relevant chapter) on the basis that this will, at the time of decommissioning, have a greater potential impact than retention, so allowing for a conservative assessment of the potential significant effects.

2.12.5 There will be no permanent lighting installed at the access points and access will be controlled through gates at all stages.

2.12.6 Vegetation and hedgerows lost during the construction of the Bespoke Access Road will be re-instated following decommissioning subject to the road being removed.

## Public Rights of Way (PRoW)

2.12.7 PRoW Ewer/12/1 is being extended in a south and westerly direction as a permissive path terminating in the vicinity of Ewerby Thorpe, and will be in place for the operational duration of the Proposed Development, on a route to be determined via the discharge of requirement in the **Draft DCO (Document Ref: 3.1)**, but approximately running in a south easterly direction along Car Dyke then heading south west on the north side of Hodge Dike. An undetermined number of footbridges (unlikely to be more than eight in number) to cross existing watercourses, will be required and will require Internal Drainage Board (IDB) agreements in parallel with discharge of requirement.

# 2.13 Connection Works

2.13.1 To accommodate the proposed connection, works to the existing Bicker Fen National Grid Substation are required (Work Nos. 5 A – E). The substation extension (Work Nos 5 A – E) will be delivered by National Grid (see Section 5.2 below). For further details on the substation extension works reference should be made to **Appendix 2.1: Grid Connection Construction Method Statement (Document Ref: 6.3 ES Vol.2, 6.3.4)**.

2.13.2 The extension will be to the south-west of the existing substation site, as determined by National Grid Electricity Transmission (NGET) and National Energy System Operator (NESO) to take into account the needs of other customers connecting into the National Electricity Transmission System (NETS).

2.13.3 NGET have requested that there be optionality within the design of the extension to Bicker Fen substation. The extent of the two design options can be seen in **Land Take Design Options (Bicker Fen Substation) (Document Ref: 2.26)**. The two design options that are under consideration are: Air Insulated Switchgear (AIS) and Gas Insulated Switchgear (GIS). Further information on these options is set out below.

2.13.4 These works have minimal impact to the transmission network outside of Bicker Fen substation. However, the works within the substation will require the delivery of new equipment, groundworks to extend the site (including possible concrete pours for the base) and electrical works.

## Air Insulated Switchgear

2.13.5 The system already in operation at the Bicker Fen substation is an AIS solution. The required extension at Bicker Fen, if AIS technology is the chosen technological solution, would require the installation of switches, fuses, relays, instrument transformers, circuit breakers, disconnectors, busbars, an emergency generator, apparatus for the support of electrical conductors and cable sealing ends.

2.13.6 The area of land required for the substation extension under an AIS system is approximately 18,022m$^2$ and a height of 15m (subject to NGET's final design and reflective of the additional area assumed for the works necessary to deliver the Heckington Fen generation bay). The interface of the Proposed Development with the Heckington Fen Solar Park Order 2025 is discussed further below, see paragraphs 2.13.14 to 16. The new equipment for the AIS solution would look similar to the equipment already installed at the National Bicker Fen Substation site. **Bicker Fen Substation Indicative Layout (Document Ref: 2.27)** is an early indicative design from NGET showing that this application's bay is located to the south-east of the extension.

2.13.7 The AIS solution will include a new generation bay, a new generation bay control room and a perimeter access road. A new generation bay will also include electrical equipment required for connection to the transmission system.

2.13.8 The generator bay control room for the Proposed Development will contain protection and signal interfaces between the generator bay, the Solar Array

Area and the National Grid. The size is approximately 8m x 5m x 4m. A perimeter road is proposed within the wider design envelope (18,022m$^2$) which will be approximately 4.5m wide.

2.13.9 As a result, if an AIS solution is used, a section of plantation woodland will need to be removed and this is discussed further in **Appendix 6.6: Arboricultural Impact Assessment (Document Ref: 6.3 ES Vol.2, 6.3.18)** and in **Chapter 6: Landscape and Visual (Document Ref: 6.2 ES Vol. 1, 6.2.6).** The extent of the worst-case removal can be seen in **Drawing Plantation Removal (Bicker Fen Substation) (Document Ref: 2.31)** and **Drawing Land Take Design Options (Bicker Fen Substation) Document Ref: 2.26).**

## Gas Insulated Switchgear

2.13.10 GIS is an alternative technology to AIS which may be used to extend the Bicker Fen substation. Its installation would not result in the removal of the operating AIS equipment which is already present at Bicker Fen Substation.

2.13.11 A GIS system requires the same electrical equipment as the AIS technology. The difference is that GIS equipment is insulated from earth by an insulating gas. The GIS would be up to 90% smaller in size compared to the AIS solution. It has been determined by NGET that if a GIS was used at Bicker Fen it would be Sulphur Hexafluroide ($SF_6$) free. The National Policy Statement for electricity networks infrastructure (NPS EN-5, November 2023) strives for applicants to avoid the use of $SF_6$ (see NPS EN-5 paragraphs 2.9.59 - 64 and 2.10.14 - 15). As any GIS design at the Bicker Fen Substation extension would be $SF_6$ free there is no policy requirement for this ES to consider the alternative technologies and why they are not technically feasible.

2.13.12 The GIS System would be partially housed inside a building. The maximum indicative dimensions of this building are 30m x 20m x 15m. A plan of the indicative design of this GIS substation barn can be seen in **GIS Building Drawing (Bicker Fen Substation) (Document Ref: 2.29).** The GIS system will also require electrical equipment to be installed outside of the barn. The maximum area of land required for all items within the GIS solution would be 75m x 75m x 15m.

2.13.13 The GIS solution will include a new generation bay, a new generation bay control room and a section of perimeter access road. Within the new generation bay will be electrical equipment required for connection to the transmission system. The generator bay control room will contain protection and signal interfaces between the generator bay, the Solar Array Area and the National Grid. The size is approximately 8m x 5m x 4m. A perimeter road is proposed within the wider design envelope which will be approximately 4.5m wide.

2.13.14 At this time NGET do not have a detailed design of the GIS solution. The assessments in this ES is therefore based on the maximum typical parameters (as advised by NGET) for this type of solution and confirmation that no $SF_6$ will be required for the operation of this design solution. NGET have advised that the traffic movements required for the construction of the GIS system should be assessed as equivalent to the construction traffic movements required for the AIS system.

### Interface with Heckington Fen

2.13.15 Within the PEIR it was stated that the same works package included in the Heckington Fen DCO will be included in the Beacon Fen DCO. Following engagement with National Grid, it is now understood that the work package in the Heckington Fen Solar Park Order 2025 excludes the area required for the Beacon Fen generator bay.

2.13.16 It is understood that NGET proposes to carry out the substation extension works for the Heckington Fen and Beacon Fen projects simultaneously, as one single construction programme (For further details, reference should be made to **Appendix 2.1: Grid Connection Construction Method Statement (Document Ref:6.3 ES Vol.2, 6.3.4)**.

2.13.17 Accordingly, and in view of this desired 'singular' construction programme, this application includes the extent of the land required, and along with the powers necessary, to enable the construction of generator bays for both Heckington Fen and Beacon Fen. The Heckington Fen Solar Park Order 2025 provides NGET with the necessary powers to carry out the extension works specifically for the additional generator bay to enable that project's grid connection. Notwithstanding this, incorporating the aggregate powers and land required for the construction of both generator bays within this project's DCO is considered prudent to ensure the delivery of Beacon Fen is not dependent on a third-party project coming forward. This approach was discussed and agreed with NGET in pre-application consultation. The full extent of the works has been considered in this ES.

## 2.14 Construction Phase

### Programme

2.14.1 Subject to the DCO Application being granted consent in 2026, construction is anticipated to commence in 2027 and last for 2.5 to 5 years. However, the construction programme will be dependent on environmental and market factors. The Bespoke Access Road and Cable Route can commence construction at the same time and are anticipated to last between:

- Bespoke Access Road: 6 to 12 months
- Cable Route: 12 to 24 months

2.14.2 All material construction on the Solar Array Area will follow the completion of the Bespoke Access Road and last between 24 to 36 months. Some limited preparatory works may be carried out on the Solar Array Area simultaneously to the construction of the Bespoke Access Road.

2.14.3 Construction of the Bicker Fen substation extension will be undertaken separately by National Grid and is anticipated to last 60 weeks.

2.14.4 The construction phase will be supported and regulated by a Construction Environmental Management Plan (CEMP). **Appendix 2.4: Outline CEMP (OCEMP) (Document Ref: 6.3, ES Vol.2, 6.3.7)** has been developed to support this application.

## CEMP

2.14.5 The Outline CEMP describes the framework of mitigation measures which have been identified in the ES to avoid and reduce and identified adverse effects arising from the construction of the Proposed Development. In accordance with a requirement in Schedule 2 to the **Draft DCO (Document Ref: 3.1)**, no part of the Proposed Development may commence construction until a detailed CEMP (or CEMPs) (which must be substantially in accordance with the Outline CEMP) for that part has been submitted to and approved by the relevant planning authority, or, where the part falls within the administrative areas of multiple relevant planning authorities, each of the relevant planning authorities. All construction works associated with the Proposed Development must be carried out in accordance with the approved CEMP (or CEMPs). The aim of the CEMP is to avoid and/or reduce environmental impacts from:

- Construction traffic (including parking and access requirements) and changes to access and temporary road or footpath diversions (if required);
- Use of land for compounds;
- Noise and vibration;
- Utilities diversion;
- Dust generation;
- Soil removal;
- Lighting; and
- Waste generation.

## Activities

2.14.6 Construction activities are anticipated to include:

### Site Wide Activities

- Site preparation including setting up access, compounds and security;
- Import of construction materials, plant and equipment to the Site;
- Diversion and installation of utilities as required;
- Marking out the location of infrastructure;
- Appropriate storage and capping of soil; and
- Upgrading of existing site tracks/access roads and construction of new tracks, including creation of the Bespoke Access Road.

### Bespoke Access Road

- Site preparation (clearing vegetation, marking boundaries);

- Topsoil strip;
- Excavation and levelling;
- Works to widen and surface the public highway and private means of access;
- Base layer installation;
- Creation of accesses from the public highway;
- Creation of visibility splays;
- Works to create associated drainage infrastructure;
- Creation of temporary construction compounds;
- Erection of temporary fencing and hoarding and permanent access gates; and
- Road surface application;
- Finishing and quality checks.

### Solar Array Area

- Import of components to the Site;
- Piling and erection of PV Mounting Structures;
- Mounting of PV Panels;
- Trenching and installation of electric cabling;
- Installation of Power Conversion Units (PCU);
- Installation of BESS;
- Construction of Onsite Substation;
- Concrete pouring for foundations;
- Cable installation (including trenching);
- The establishment of construction compounds and haul roads;
- Stripping of topsoil and ground levelling in sections for the Onsite Substation and BESS area only;
- Appropriate construction drainage with pumping where necessary;
- Sectionalised approach of duct installation;
- Excavation and installation of jointing pits;
- Cable installation;

- Testing and commissioning; and
- Site reinstatement, habitat creation and landscaping.

### Cable Connection to Bicker Fen Substation

- The establishment of construction compounds and haul roads;
- Stripping of topsoil in sections;
- Trenching in sections;
- Appropriate storage and capping of soil;
- Appropriate construction drainage with pumping where necessary;
- Sectionalised approach of duct installation;
- Excavation and installation of jointing pits;
- Cable joint installation;
- Cable installation;
- Implementation of crossing methodologies for watercourses, infrastructure (including roads and rail), and sensitive habitats (e.g. trenchless techniques such as Horizontal directional drilling and cofferdam)
- Testing and commissioning; and
- Site reinstatement of disturbed areas that facilitated construction, habitat creation and landscaping.

## Site Reinstatement, Habitat Creation and Landscaping

2.14.7 As highlighted in the list above, site reinstatement will form part of the construction activities. This will include habitat creation, enhancement and landscaping. These works will be managed in accordance with the principles set out in the **Outline CEMP (Document Ref: 6.3, ES Vol.2, 6.3.7)** and Outline Landscape and Ecological Management Plan (OLEMP) **(Document Ref: 6.3, ES Vol.2, Appendix 6.7, 6.3.19**). The proposed planting is presented in **Figure 6.34 Landscape Strategy Plan (Document Ref: 6.4 ES Vol.3, 6.4.41**) and discussed in **Chapter 6: Landscape and Visual (Document Ref: 6.2 ES Vol.1, 6.2.6),** and **Chapter 7: Ecology (Document Ref: 6.2 ES Vol.1, 6.2.7)**.

## Construction Staff

2.14.8 At the peak of construction, which is anticipated to be in 2027, it is estimated there will be 433 staff members.

## Construction Hours of Work

2.14.9 The core working hours considered in this ES have been assumed to be as follows. However, these working hours may be reduced during winter months reflective of the seasonal daylight hours:

*0700 – 1900 Monday to Friday*

*0800 – 1300 Saturdays*

*Subject to the paragraph below, no works will take place on Sundays or Bank Holidays*

2.14.10 Some activities may need to occur outside of these hours due to activities which need to be undertaken continuously (such as HDD and cable jointing). Where work outside of times is necessary, prior notification will be provided to the relevant local planning authority.

2.14.11 Additionally, quiet non-intrusive works such as the installation of PV modules may take place over longer periods during the high summer and other quiet non-intrusive works such as electrical testing, commissioning and inspection may take place over longer periods throughout the year

## Construction Traffic

2.14.12 Access arrangements to the Solar Array Area, Cable Route Corridor including compounds and the Bicker Fen Substation have been considered and are described in detail within **Appendix 9.1: Transport Assessment (Document Ref: 6.3 ES Vol.2, 6.3.54).** The A17 is the principal road near the site which will accommodate construction vehicle movements from the wider road network.

2.14.13 As described above, access to the Solar Array Area during material construction in this area will be provided via a Bespoke Access Road from the A17. A small number of vehicles may need to access the Solar Array Area before the completion of the Bespoke Access Road for limited preparatory works. Given the very small number of vehicles in question and the low intensity of these works, these vehicles will use the existing local road network. This traffic will be within the daily variation of flow on the local network, and the change in traffic will be imperceptible. Once construction has been completed, the Bespoke Access Road will remain in place to facilitate operational maintenance access and if requested to first responders, and in particular for decommissioning.

2.14.14 Construction access to the cable route will be from the Solar Array Area/Howell Fen Drove; A17; Carterplot Road; and Great Hale Drove. There are six main temporary construction compounds that are spread proportionately along the cable route to facilitate proper construction management, with temporary roadways to facilitate access to all land within the Site. The access tracks to be constructed onsite are anticipated to be between 3.5m and 9m wide and comprised of compacted stone tracks with 1:2 gradient slopes on either side.

2.14.15 Table 2.2 below demonstrates the Annual Average Daily Traffic (AADT), Annual Average Weekly Traffic (AAWT) and Average Daily Flow (two-way) by vehicle type for the A17.

**Table 2.2 Construction Traffic**

| | FULL CONSTRUCTION PERIOD | | PEAK CONSTRUCTION (12MONTHS: AUG 2027 TO JUL 2028) | | PEAK MONTH (OCTOBER 2027) |
|---|---|---|---|---|---|
| | **AADT** | **AAWT** | **AADT** | **AAWT** | **Average Daily Flow (two-way)** |
| **Car** | 116 | 163 | 219 | 307 | 332 |
| **Minibus** | 11 | 16 | 21 | 30 | 32 |
| **LGV** | 5 | 7 | 3 | 5 | 15 |
| **HGV** | 36 | 51 | 58 | 82 | 130 |
| **Total** | **168** | **236** | **302** | **424** | **509** |

2.14.16 Vehicle movements during peak construction month (October 2027) are anticipated to be as follows: up to 130 HGV movements per day, and up to 15 Light Goods Vehicle (LGV) movements per day. Additionally, the Bespoke Access Road will carry up to 332 car movements and 32 minibus movements per day.

2.14.17 The AADT and AAWT values for peak construction are higher than those for full construction. This is because peak construction only considers the 12-month period where construction activity is expected to be at its highest. The averages for full construction encompass all vehicle movements expected over the full construction period.

2.14.18 Construction traffic predictions and routing are discussed further in Chapter 9: Access and Traffic. **Appendix 9.3: Outline Construction Traffic Management Plan (CTMP) (Document Ref: 6.3 ES Vol. 2, 6.3.57)** has been developed to support the application.

## 2.15 Proposed Phasing

2.15.1 Following the submission of the DCO application in 2025 and subject to DCO consent then being granted in 2026, the subsequent phases of the Proposed Development would comprise construction, operation/ maintenance and eventual decommissioning. Indicative details regarding these three phases are outlined below.

### Construction

2.15.2 As highlighted in Section 2.14 above, it is anticipated that construction would commence in 2027 and last between 2.5 to 5 years.

2.15.3 The construction of the extension works at Bicker Fen substation will be undertaken separately by National Grid over a period of circa 60 weeks. To enable this, National Grid are named as the "undertaker" for the purposes of the relevant Work Number in the **Draft DCO (Document Ref: 3.1)** for the substation extension (Work No.5).

### Operation

2.15.4 The overall lifespan of the entire Proposed Development encompassing construction and decommissioning is expected to be approximately 45 years, with 40 years being the expected (and maximum) operational lifespan of the solar arrays and BESS. The Bespoke Access Road will become operational

first to facilitate construction (2.5 to 5 years) and is also likely to remain in operation during the decommissioning phase (1 to 3 years).

2.15.5 There will be a requirement for periodic replacement of some or all of the elements of the Proposed Development. At this stage, the level of vehicle trips associated with component replacement (e.g. batteries and panels) is expected to be considerably lower than the level of vehicle trips generated during the peak construction phase. For example, even in the instance that full panel replacement is required, this would be programmed in stages over a much longer period than the construction phase (when the panels will be installed more rapidly). This approach would maximise the number of panels which are kept 'live' at any given time and avoid compromising the electricity generating capacity of the Solar Array Area. Otherwise, components would be replaced as and when required throughout the operational lifetime of the Proposed Development.

2.15.6 All replaced components will be recycled or disposed of in accordance with good practice and market conditions at that time.

## Decommissioning

2.15.7 The decommissioning phase of the Proposed Development is anticipated to last between approximately 12 and 36 months, dependent on landowner requirements regarding the Bespoke Access Road. The Proposed Development will return to an agricultural land use with reinstatement and enhancement planting as required and where practical with consideration of easements. This is discussed further in **Chapter 6: Landscape and Visual (Document Ref: 6.2 ES Vol.1, 6.2.6).**

2.15.8 A Decommissioning Environmental Management Plan (DEMP) will support the Decommissioning phase. **Appendix 2.5: Outline DEMP (ODEMP) (Document Ref: 6.3 ES Vol.2, 6.3.8)** has been prepared to support this application.

### Bespoke Access Road

2.15.9 The road will likely be the last aspect to be removed as it will be used to facilitate decommissioning of the Solar Array Area. Whilst it is assumed that the road will be removed, it is possible that engagement with the landowners at that time will establish a preference for it to be retained. Optionality has been deliberately retained in the Application to facilitate such a scenario. For the purposes of this ES, each topic has assumed the removal of the road (unless otherwise stated in the relevant chapter) on the basis that this will, at the time of decommissioning, have a greater potential impact than retention, so allowing for a conservative assessment of the potential significant effects.

### Solar Array Area

2.15.10 As part of the decommissioning phase, all PV modules, mounting structure, inverters, transformers, switchgear, the Onsite Substation, BESS, fencing and ancillary infrastructure would be removed from Site and recycled or disposed of in accordance with good practice and market conditions at that time. Foundations and other below ground infrastructure, which are not practicable to remove, will be cut below the surface to enable future ploughing. Any piles would be removed.

2.15.11 Buried medium voltage cables would either be removed and land restored or remain in situ. For the purposes of this ES, each topic has considered the option of removal or remaining in-situ that represents the worst-case scenario, relevant to the topic under consideration.

### Cable Route

2.15.12 The 400kV cable will not be removed as part of the decommissioning phase and instead remain in situ.

### Bicker Fen Substation

2.15.13 It is anticipated that the works undertaken as part of the extension at the Bicker Fen substation will also remain in situ. This would remain under National Grid's control.