

# National Grid Cable Tunnel Replacement Project

## Design and Access Statement Gravesend

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## Quality information

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# 1 Introduction

- 1.1.1 This Design and Access Statement has been prepared to support a planning application being made by National Grid Electricity Transmission (hereafter “National Grid”) relating to the Cable Tunnel Replacement Project (hereafter referred to as ‘the Proposed Development’). It covers the elements of the Proposed Development at Gravesend, under Gravesham Borough Council’s jurisdiction. An equivalent Design and Access Statement has been prepared based on the elements of the Proposed Development proposed at Tilbury and submitted with the planning application to Thurrock Council.
- 1.1.2 National Grid own the high voltage electricity transmission system in England and Wales and operates the electricity transmission system across Great Britain, carrying power between power stations and the local electricity supply networks of the Distribution Network Operators (DNOs).
- 1.1.3 National Grid is regulated by the Office for Gas and Electricity Markets (Ofgem). Through the terms of its transmission licence and obligations under Schedule 9 of the Electricity Act 1989<sup>1</sup>, National Grid is required to operate its transmission system in an economic, efficient and co-ordinated manner whilst having regard to the preservation of amenity.
- 1.1.4 Schedule 9 requires National Grid to have regard to the desirability of preserving natural beauty, conserving flora, fauna and geological or physiographical features of special interest and of protecting sties, buildings and objects of architectural, historic or archaeological interest. The Schedule also requires National Grid to do what it reasonably can to mitigate any effect which its proposals would have on such features.
- 1.1.5 The Proposed Development comprises the construction of a new bored tunnel under the River Thames to house new cross linked polyethylene (XLPE) cables.
- 1.1.6 In addition, the Proposed Development comprises the following above-ground components at both ends of the new tunnel:
- **A new cable sealing end compound (SEC):** consisting of:
    - **a new tunnel headhouse** which will cover the shaft into the tunnel;
    - **a new overhead line gantry structure** which will connect the overhead line downlead conductors and transfer them to six sealing end structures; and
  - **Modifications to the existing overhead line (OHL):** The new OHL conductors will be connected to the existing 400kV OHL conductors via new terminal pylons. The old OHL conductors and existing pylons will be either replaced, refurbished or removed. This element of the project is not consented via the Town and Country Planning Act so is not discussed any further.
- 1.1.7 The new SECs will fall within Thurrock Council and Gravesham Borough Council’s jurisdiction.
- 1.1.8 National Grid is seeking to secure full planning permission for the two new SECs and new bored tunnel by way of a planning application to be submitted under the Town and Country Planning Act 1990 to Thurrock Council and Gravesham Borough Council. The Planning Application will allow for the construction compounds associated with these works.
- 1.1.9 Section 62 of the Town and Country Planning Act 1990 (as amended)<sup>2</sup> requires a Design and Access Statement to be submitted with most major developments for both outline and detailed planning applications.
- 1.1.10 This Design and Access Statement addresses those elements of the Proposed Development for which planning permission is being sought, namely the proposed new SECs containing new headhouses and a section of new bored tunnel on each side of the River Thames.
- 1.1.11 The purpose of this Design and Access Statement is to explain how the principles of good design have been considered from the inception of the development process and to explain the concept

<sup>1</sup> <https://www.legislation.gov.uk/ukpga/1989/29/schedule/9>

<sup>2</sup> <https://www.legislation.gov.uk/ukpga/1990/8/section/62>

and principles relating to use, amount, layout, scale, landscaping, appearance and access of the proposed SEC.

1.1.12 This Design and Access Statement has been prepared in line with the Commission for Architecture and the Built Environment (CABE) guidance 'Design and Access Statements: How to write, read and use them' (2006). This document provides information on the following:

- Use: What the buildings and spaces will be used for;
- Amount: How much will be built on the site;
- Layout: How the buildings and open spaces will be arranged on the site;
- Scale: How large the buildings and spaces will be;
- Landscaping: How the open spaces will be designed;
- Appearance: What the buildings and spaces will look like; and
- Access: How access will be provided.
- Sustainability: How sustainable design has been incorporated

1.1.13 This document is structured as follows:

- Section 1 – Introduction;
- Section 2 - Development Design, Concept and Layout;
- Section 3 – Access; and
- Section 4 – Conclusion.

## 2 Development Design, Concept and Layout

### 2.1 Introduction

2.1.1 This section describes the key components of the proposed headhouses and SECs including details of the use, amount, scale, layout, landscaping and appearance of the proposed elements.

### 2.2 Site Description

2.2.1 The proposed Gravesend SEC will be located within a vegetated area which is part of the Canal and Grazing Marsh, Higham Local Wildlife Site (LWS), designated for its grassland habitats and on land owned by National Grid at approximately TQ 67455 74158. To the north of the Proposed SEC is the existing SEC serving the existing tunnel. The land immediately east is owned by the Royal Society for the Protection of Birds (RSPB) and is partially leased and used as a Police Training Centre for rifle shooting. The land immediately west comprises of the Thameside Campus (National Maritime Training Centre), Metropolitan Police Specialist Training Centre (MPSTC) and Thames and the Medway Canal Association.

2.2.2 The new SEC is approximately 100m north of the Thames Estuary & Marshes (Ramsar Site and Special Protection Area) and South Thames Estuary and Marshes Site of Special Scientific Interest (SSSI). The land required for the development of the new SEC will be within the Canal and Grazing Marsh, Higham Local Wildlife Site (LWS).

2.2.3 The land required is not subject to any locally, nationally or internationally important landscape designations.

### 2.3 Key Components

#### New Bored Tunnel

2.3.1 The new cable tunnel will be approximately 2.2km long (from headhouse to headhouse), 4m in internal diameter (4.5m external diameter) and with the alignment illustrated in Figures 3.1 and 3.2 in ES Volume II Chapter 3: Project Description (also provided below). The depth of the tunnel is approximately -34m Above ordnance Datum (AoD) to - 32mAoD, and approximately three to four tunnel widths below the river bed.

2.3.2 Twelve new cross linked polyethylene (XLPE) cables will be installed in the new tunnel, once bored, to match the required 3325 megavolt amperes (MVA) maximum rating.

2.3.3 Due to advances in cable technology, XLPE is now being used in preference to the use of fluid filled cable (like those installed in the existing tunnel). In these modern cables, the central conductor is insulated by means of a cross linked polyethylene material, which is extruded around the conductor. The absence of fluid in the cable insulation enables a more mechanically robust overall cable construction. XLPE cables require less maintenance, with no ancillary fluid equipment to monitor and maintain. For example, sulphur hexafluoride (SF<sub>6</sub>), typically used in electricity transmission and distribution to insulate live electrical parts and to switch the flow of electrical current on and off, is not required to be used in this project.

2.3.4 Each cable needs to be well-spaced from others for adequate heat dissipation which will be achieved by forced air ventilation.

#### Sealing End Compound

2.3.5 A new SEC is required to achieve the transition from an underground cable connection to overhead line (OHL).

- 2.3.6 The SEC is located as close to the existing OHL as possible, thus also minimising the extent of new OHL required to connect with the existing OHL.
- 2.3.7 A new terminal pylon (to be situated to the east of the proposed SEC) will be constructed to connect the existing OHL to the new SEC.
- 2.3.8 The planning drawings included in the application present the following:
- Site location of the SEC shown in Planning Drawing TKRE/60677311/Gravesend/Site Location Plan;
  - A ground floor plan of the Gravesend headhouse shown in Planning Drawing PDD-100116-LAY-054;
  - A proposed roof floor plan of the Gravesend headhouse, shown in Planning Drawing PDD-100116-LAY-056;
  - A site layout plan of the Gravesend SEC shown on Planning Drawing PDD-100116-LAY-053;
  - A section plan of the Gravesend SEC shown on Planning Drawing PDD-100116-LAY-184;
  - Elevations of the Gravesend headhouse shown on PDD-100116-ELE-005 including (south east, north east, north west and south west elevations); and
  - Outline cross-sections of the Gravesend headhouse shown on PDD-100116-LAY-057.

## Headhouse

- 2.3.9 A permanent headhouse will be located within the SEC at Gravesend. The headhouse will provide access to the tunnel shaft and will contain mechanical and electrical equipment.
- 2.3.10 The main function of the headhouse is to provide means of access into the tunnel as well as contain the primary electrical systems, including the required life safety systems and mechanical equipment required to ventilate the tunnel between Gravesend and Tilbury. The equipment is accommodated in specific areas of the headhouse. There are secondary functions located within the headhouse, including workspaces, and welfare accommodation.
- 2.3.11 The Gravesend headhouse is identified as a passive headhouse, the implications of which are that there is less equipment needing to be accommodated and no fans are located within this building.
- 2.3.12 The building must be located over the shaft, with its precise position being determined as a direct response to the need for shaft access and location of cables.
- 2.3.13 The location of the headhouse is shown in Planning Drawing TKRE/60677311/Gravesend/Site Location Plan . An indicative ground floor plan of the headhouse is shown in Planning Drawing PDD-100116-LAY-054, with elevations of the headhouse shown in Planning Drawing PDD-100116-ELE-005.

## 2.4 Consideration of Alternatives

- 2.4.1 A full description of the alternatives considered for the Proposed Development is provided in the Environmental Statement (ES), Volume II Chapter 2: Alternatives.
- 2.4.2 Within this chapter, an overview is provided of the Strategic Options Appraisal carried out prior to design stage. The report concluded that the installation of new cables within a new tunnel beneath the River Thames was preferable compared with installing new cables within the existing tunnel or opting for an overhead line crossing the River Thames. The main reasons were due to health and safety concerns associated with working within the existing tunnel, lower and more temporary environmental impact compared to that of a new overhead line. The three strategic options were discussed with relevant consultees in order to receive their feedback, and the emerging preference was for option 2: a new tunnel. No objections to a new tunnel were received from these consultees.
- 2.4.3 Once the decision to adopt the new tunnel was taken, further siting work was carried out to identify areas that were suitable for the temporary and permanent infrastructure required in Tilbury and

Gravesend. A range of considerations including, former land use, access to a major road, environmental constraints, topography, engineering design and cost were factored into the decision to determine the approach and location for the tunnel location and shaft, associated above ground infrastructure.

## 2.5 Use

2.5.1 The operational SEC including the headhouse building will be predominantly an unoccupied facility, with limited numbers of personnel, who only attend site for maintenance, inspection purposes, or in the event of an emergency.

### Sealing End Compound

2.5.2 The proposed SEC is required to achieve the transition from an underground connection to OHL. The SEC compound will contain cable terminations (cable sealing ends), electrical equipment and support structures, and the tunnel shaft and headhouse, enclosed by security fencing.

2.5.3 The SEC will not require day to day access and will not be open to the public.

### Headhouse

2.5.4 The headhouse within the SEC will provide maintenance access to the shafts and tunnel. The headhouse will accommodate:

- Main entrance and corridor;
- Staircase to the bottom of the shaft;
- Electrical room;
- 110V battery/UPS room;
- Tally Room;
- Changing room; and
- Water Closet (WC).

2.5.5 Externally, the new headhouse will have:

- a biodiverse brown roof;
- a temporary generator (hardwired to the LV Switch Room);
- an access hatch for cable feed; and
- a pedestrian access path.

## 2.6 Design

### Sealing End Compound (SEC)

2.6.1 The construction of the proposed SEC and terminal pylon will facilitate the connection from cable connection to the existing 400kV OHL.

2.6.2 An indicative layout for the SEC has been derived following considerations of the spatial requirements of the key components of the SEC together with technical/site constraints. The SEC compound design is based on safely and efficiently containing the required plant and equipment whilst complying with the relevant safety, security and technical standards.

### Headhouse

2.6.3 The headhouse within the SEC has been designed as a predominantly functional building to serve the proposed use of the development, whilst being mindful of the sensitive ecological habitats in its vicinity.



2.6.4 The headhouse building is split into two main areas:

- Tunnel damper room; and
- Ancillary accommodation

### **Tunnel Damper Room**

2.6.5 This is positioned over the shaft, with the footprint and height of this space being determined by the required ventilation duct assemblies and areas of ventilation louvres needed.

2.6.6 The ductwork from the shaft connects via a plenum to the exhaust air louvres in the external walls.

2.6.7 Also installed in this room will be an access hatch, with a lifting beam over, which will primarily be used to lower the equipment and the tunnel vehicle (electric trike) down the shaft and into the tunnel below. The lifting beam will also facilitate the installation and subsequent replacement of any equipment within the shaft or this end of the tunnel.

2.6.8 There will be storage cabinets and space for the charging of the tunnel vehicle within the room.

2.6.9 The large roller shutter, to the north elevation, is located to align with the site access road and the internal access hatch. This enables easy access for delivery and movement of any items that need to be off loaded into the building and lowered down the shaft.

2.6.10 A personnel door has been located adjacent to the roller shutter primarily for fire escape, which is guarded from the site road by galvanised barriers, for safety reasons.

### **Ancillary Accommodation:**

2.6.11 The remainder of the building contains the following accommodation:

- Main entrance and corridor;
- Staircase to the bottom of the shaft;
- Electrical room;
- 110V battery/UPS room;
- Tally Room;
- Changing room; and
- WC.

### **Main Entrance**

2.6.12 This is located on the west elevation directly opposite the 6 new site car parking spaces. The entrance will have a level threshold and gives direct access to the main circulation corridor within the building, off which all rooms are accessible.

### **Staircase**

2.6.13 This is the access for operatives into the shaft and tunnel. The staircase is enclosed above the headhouse floor level and has a door opening from the staircase into the corridor for ease of escape in the case of an emergency.

### **Electrical Room**

2.6.14 This room contains the main electrical panels and control equipment to be located at this end of the tunnel.

### **Battery / UPS room**

2.6.15 Within this room is located banks of the required 110V batteries as well as the UPS (Uninterruptible Power Supply) equipment serving systems in the building

## Tally Room

- 2.6.16 This provides a small area with a worksurface where operatives can process any necessary documentation without the need to access the electrical room. It also provides a specific location identifying any personnel who have access to the tunnel.

## Shower/Changing and WC

- 2.6.17 Welfare facilities within the headhouse are limited due to the low occupancy and infrequent use of the building. Minimal accommodation is therefore provided within these two rooms.
- 2.6.18 The arrangement and size of the WC is based upon the requirements of a disabled toilet.

## Temporary Generator Provision

- 2.6.19 External to the building, provision has been made for a hardstanding area where a temporary electrical generator can be located, should a failure of the mains electrical power supply to the building occur. This has been located close to the building, so that connections can be made to the generator connection panel on the external wall, without affecting vehicle or personnel access to the building.

## 2.7 Amount and Scale

### Sealing End Compound (including headhouse)

- 2.7.1 The footprint of the sealing end compound including the headhouse is approximately 6, 210 m<sup>2</sup>.

### Sealing End Compound

- 2.7.2 The SEC site will comprise the following equipment as shown on Planning Drawing PDD-100116-LAY-046 attached:
- 12 new XLPE cables;
  - 12 new cable terminations (polymeric);
  - 12 new cable support steel structures with buried concrete foundations;
  - Concrete surface troughs for new cables;
  - 6 Surge Arresters for protection of underground cables; and
  - 6 earth switches.
- 2.7.3 The highest equipment within the SEC will be the compound gantry which will be approximately 13 m and is shown on Planning Drawing PDD-100116-LAY-180.

### Headhouse

- 2.7.4 The proposed footprint of the headhouse building alone will be approximately 233m<sup>2</sup> (15.550m x14.985m).
- 2.7.5 The proposed internal floor level for the headhouse building has been established at 3.500m Above Ordnance Datum (AOD) and has an overall height of 7.865m (level above AOD is 11.365m).
- 2.7.6 The size of the headhouse is determined by the requirement for mechanical and electrical equipment to ventilate and access the tunnel and tunnel shaft. The size is also driven by spacings required between the overhead line conductors where they connect to the building before transitioning to the cable sealing end structures.
- 2.7.7 A ground floor plan of the headhouse is shown on Planning Drawing PDD-100116-LAY-054 with the proposed roof floor plan for the headhouse shown on Planning drawing PDD-100116-LAY-056, elevations shown on PDD-100116-ELE-005 and cross-sections shown on PDD-100116-LAY-184.

## 2.8 Layout

- 2.8.1 The indicative layout for the SEC has been designed to respond to the sense of place of the local landscape whilst taking into account a number of technical and environmental constraints. The layout and positioning of the SEC has reflected the need to minimise impacts on sensitive habitats in the vicinity.
- 2.8.2 The SEC compound designs also reflect safety and efficiency, containing the required plant and equipment whilst complying with the relevant safety, security and technical standards.

## 2.9 Sustainability

- 2.9.1 The Proposed Development is one of 17 key projects that National Grid has identified across the country as being critical to enabling the country's rapid transition toward decarbonisation and ultimately net zero carbon emissions, in line with the commitments in the Climate Change Act 2008.
- 2.9.2 Against this backdrop, sustainable design and construction has been a key focus during the optioneering and design stages of the Proposed Development. National Grid has numerous environmental and sustainability commitments and targets that all projects must work towards and a bespoke Sustainability Action Plan has been developed and regularly updated for the Proposed Development to capture opportunities and make alterations to the design.
- 2.9.3 The Sustainability Action Plan is wide ranging and includes measures that reduce emissions, minimise waste, sustainable resource use, incorporate biodiversity net gain and care for the natural environment.
- 2.9.4 For further information, see the Sustainability Statement submitted with this planning application.

## 2.10 Landscaping

- 2.10.1 The SEC compound and associated headhouse and immediate landscape proposals have been sited and designed taking into account a number of technical and environmental constraints. The landscape proposals around the SEC have sought to support the surrounding sensitive habitats and species. Refer to the Outline Landscape and Ecological Management Plan, (oLEMP) including Appendix A Landscape Masterplan.

## 2.11 Appearance

### Sealing End Compound

- 2.11.1 The general appearance of the SEC primarily derives from the functional need and the safety requirements. The majority of the structures will be finished in galvanised steel; busbars connectors and fittings will be copper/aluminium, and HV Plant insulators will be brown glazed porcelain (or grey as an option), CSE insulator will be glass reinforced silicon rubber in grey, the cable core insulation will be XLPE. All supporting structures will be set in concrete.

### Headhouse

#### Architectural Treatment

- 2.11.2 The form of the building has been kept as a simple rectangular plan, with a simple curved roof. The profiled fascias include an integral gutter to the lowest part of the roof. The curved roof will take the form of a biodiverse roof, to assist in reducing rainwater runoff and allow provision for biodiversity.
- 2.11.3 Externally the building's wall finishes consist of flat faced composite cladding panels, laid horizontally. There are two main ventilation louvre banks, with powdercoated metal class A louvres. Two banks have been chosen to enable the height of the building to be kept to a sensible minimum. All internal walls are intended to be constructed in blockwork.

## **Materials**

2.11.4 The roof will comprise the following:

- Curved standing seam with applied green roof.
- Dark grey powder aluminium fascias, integral gutters and rainwater pipes

2.11.5 The walls will comprise the following:

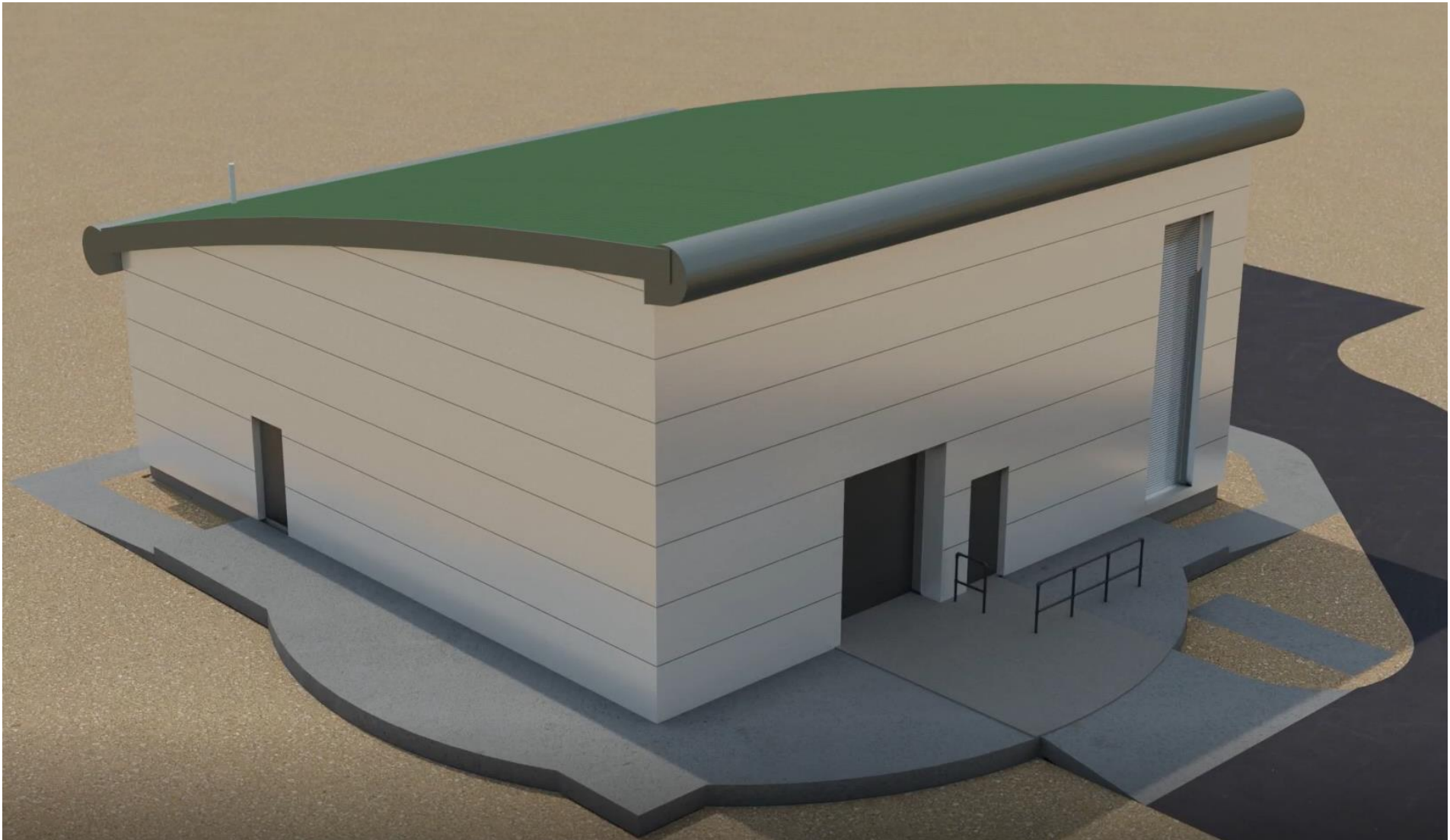
- Light Grey composite cladding wall panels
- Dark grey powder coated metal doors
- Dark grey powder coated metal louvres

2.11.6 The external works will comprise the following:

- Asphalt roads and parking
- Concrete hardstandings and paths
- Gravel ground coverings
- Security fencing with a 1m high electrified section to the top. Overall height of the fence is therefore 3.4m above ground level.

2.11.7 The external appearance of the headhouse will be finished in weathered steel cladding with a roller shutter and ventilation louvre on the north west elevation.

## Plate 2-1: Indicative visualisation of the proposed Gravesend Headhouse



Source: Baker Hicks, 2023

## 3 Access

3.1.1 Access for vehicles will be via the main entrance gate to the compound and utilise the new site roads. This will include any private vehicles, access equipment (e.g., MEWPS), light goods vehicles or heavy goods vehicles.

### Inclusive Access

3.1.2 The approach to the new headhouse main entrance will comply with the provisions of Approved Document Part M of the Building Regulations<sup>3</sup>. The immediate site will have gradients enabling access to be level and easy to navigate from the new car parking. A level threshold will be provided to the main entrance and fire escape to the east end of the corridor.

3.1.3 The Gravesend compound and headhouse is a controlled Power Industry facility, where most of the activities undertaken are unsuitable to be carried out by people with either visual or physical disability. In this instance the requirements of safety and operation of the facility need to take priority over provisions of the Equalities Act. It is not practical for wheelchair users to work within the facility without compromising themselves or the installations within the facility. For this reason, the design of the headhouse can be separated into two distinct parts in relation to provision of disabled facilities:

- The Operational areas of the facility – It has been acknowledged, by National Grid, that these areas will not need to be designed to comply with all aspects of Approved Doc. Part M and the Equality Act 2010<sup>4</sup>.
- The Non-Operational areas – The main entrance, main corridor and toilet provision, which will comply with the requirements of Approved Doc. Part M.

3.1.4 One disabled car parking space will be provided, within the six main parking spaces, as close to the main entrance of the building as practical. There will be dropped kerbs between the access path and the side road.

### Refuse Collection

3.1.5 Due to the site and building being fundamentally an unoccupied facility there is no expectation for the generation of general waste, so no provision is deemed necessary.

3.1.6 Any waste created by maintenance works will be required to be cleared from site by those personnel, or contractors, undertaking the works and disposed of responsibly through their existing, established procedures.

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<sup>3</sup> <https://www.gov.uk/government/publications/access-to-and-use-of-buildings-approved-document-m>

<sup>4</sup> <https://www.legislation.gov.uk/ukpga/2010/15/contents>

## 4 Conclusion

- 4.1.1 The SEC location was selected as part of the options appraisal process which included discussions with stakeholders. The layout of the SEC and headhouse has reflected the need to minimise impacts on surrounding sensitive habitats, hence the co-location of equipment within the same compound and in close proximity to the existing SEC so to minimise the overhead line changes required.
- 4.1.2 The SEC, in particular the headhouse within the SEC, is first and foremost a functional building to support the purpose of the development.
- 4.1.3 The SEC have been designed to be unmanned during operation. Infrequent visits will be required to visually inspect condition of non-mechanical equipment and structures at the SEC. Maintenance checks of the head house will be undertaken and would cover elements including the lighting, pumps and gas detection. The cables will be subjected to maintenance inspections over the length of the tunnel comprising at least one annual inspection.

## 5 Abbreviations

Abbreviations	Meaning
aOD	Above Ordnance Datum
CABE	Commission for Architecture and the Built Environment
DNO	Distribution Network Operators
ES	Environmental Statement
LV	Low Voltage
MVA	megavolt amperes
Ofgem	Office for Gas and Electricity Markets
OHL	Overhead Line
oLEMP	Outline Landscape and Ecological Management Plan
SEC	Sealing End Compound
SF6	Sulphur Hexafluoride
TKRE	Tilbury to Grain and Tilbury to Kingsnorth
WC	Water Closet
XLPE	Cross Linked Polyethylene



