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Appendix A

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3 Project and Site Description

3.1 Introduction

3.1.1 This chapter provides a description of Riverside Energy Park (REP) and its Electrical Connection together with a description of the Application Site and surroundings. This includes a description of the construction and operation (which includes maintenance) and an indication of the outline construction programme.

3.1.2 The Application Site would comprise the following:

- the REP site, located to the north of Belvedere off Norman Road;
- the Main Temporary Construction Compounds located to the south of the REP site and west of Norman Road;
- the Electrical Connection, running underground between the REP site and the Electrical Connection Point at Littlebrook substation connecting into an existing National Grid building in Dartford; and
- Cable Route Temporary Construction Compounds required to support the construction of the selected Electrical Connection route. These will be small discrete compounds, required for a period of time whilst works are undertaken along particular lengths of the Electrical Connection route.

3.1.3 The Application Site would be located within the administrative areas of the London Borough of Bexley (LBB) and Dartford Borough Council (DBC). The site extents are shown on Figure 1.1, Appendix A.1, Site Location Plan, Figure 1.2, Appendix A.1 Indicative Application Boundary and Figure 1.3a and Figure 1.3b, Appendix A.1 Indicative Location of Project Elements.

3.2 The Site and Surrounding Areas

REP Site & Main Temporary Construction Compounds

3.2.1 The REP site is located in Belvedere, in the LBB, in an area bounded to the north by the River Thames and the adjacent Thames Path long distance trail. It is bounded to the east by a boundary fence onto a public footpath linking Norman Way with the Thames Path, and to the west by a boundary fence onto the adjacent undeveloped Crossness Nature Reserve between the REP site and Thames Water’s Crossness Sewage Treatment Works (STW) site, approximately 200 m away. Within this area a public footpath links the Crossness Local Nature Reserve (LNR) with the Thames Path. A number of ditches and small watercourses surround the REP Site.

3.2.2 The REP site includes the existing jetty extending out into the River Thames but excludes the existing Riverside Resource Recovery Facility (RRRF) main building itself. The majority of the REP site is used for private vehicle circulation areas, the jetty access ramp, staff and visitor parking, open container storage, contractor maintenance, electrical substation and associated landscape/habitat areas.

3.2.3 The REP site is accessed by river via the existing jetty and by pedestrians and vehicles from Norman Road, a single carriageway road linking to the dual carriageway A2016 Picardy Manor Way.

3.2.4 To the immediate north of the REP site is the River Thames. Further north, on the opposite bank of the river is an area characterised by manufacturing, including the Ford Motor Company works, and associated car and lorry parking. To the east of the REP site and Norman Road is a large
strategic industrial area, accessed via a junction at the southern end of Norman Road. This includes two distribution centres and a document storage facility. East of these are further warehouse, distribution and similar commercial developments.

3.2.5 West of the REP site is Crossness STW, which is approximately 1 km in width from east to west and approximately 200 m from the REP site boundary. This operational STW includes settlement and sludge tanks, as well as a sludge-powered generator where sludge is thermally treated and used to generate electricity. The Grade I listed Crossness Pumping Station, built by Sir Joseph Bazalgette, is located at the western end. Further to the west of the STW is the Thamesmead residential area.

3.2.6 To the south and west of the REP site and Norman Road is Crossness Nature Reserve, a 25.5 ha LNR which is part of the Erith Marshes Site of Metropolitan Importance for Nature Conservation (SINC), containing a number of ditches, watercourses and ponds. The site is owned and managed by Thames Water. To the east of the Crossness LNR, adjacent to Norman Road is a site owned by the Applicant, with planning permission for a data centre (Local Planning Authority reference: 15/02926/OUTM). Power for the data centre is expected to be provided via a connection along Norman Road from the RRRF and REP site. South of the data centre site is the area identified as the Main Temporary Construction Compounds.

3.2.7 South of Norman Road is the A2016, formed by the dual carriageway Picardy Manor Way at its junction with Norman Road (North), and by the dual carriageway Eastern Way, south of Crossness LNR. South of Picardy Manor Way is a recent development of The Morgan pub and a Travelodge hotel building, along with five residential blocks. South of this is a residential area centred on North Road and Norman Road (South). Further south is the main area of Belvedere comprising residential dwellings, Belvedere railway station and retail outlets. South of Eastern Way are areas of undeveloped marshland, containing a number of ponds and watercourses, interspersed with commercial storage and distribution and education development, and bounded to the south and southwest by Yarnton Way, a dual carriageway.

3.2.8 The proposed Main Temporary Construction Compounds would be located in an area of previously developed land (a former National Grid substation site) adjacent to the west side of Norman Road, immediately north of its junction with A2016 Picardy Manor Way. The northern extent of this area most recently received planning permission for the erection of three industrial units for mixed-use within Class B1 (business), Class B2 (general industrial) and B8 (storage/distribution), with associated ancillary works (Local Planning Authority reference: 13/00918/FULM). Part of the southern portion comprises an existing joinery business.

**Electrical Connection**

3.2.9 The proposed Electrical Connection route runs southwards from the REP site towards the existing Littlebrook substation, in Dartford. There are a number of alternative proposed route options that have been identified through studies undertaken by UKPN, the local distribution network operator, and are shown in Figure 1.3, Appendix A.1. Only one overall route would be required to connect from the REP site to the Electrical Connection Point.

3.2.10 The Electrical Connection route options are generally located on highways through urban areas, other than route option 1 passing through the Crossness LNR and the western end of route option 2B to The Bridge development. Consequently, the site surroundings for Electrical Connection route options are generally residential, but with significant industrial and commercial areas. However, development is set back from significant lengths of route 1, even where it passes through urban areas. The surroundings of the A206 (Bob Dunn Way) currently have urban characteristics and are less built up but, apart from the Darent Valley, are in the process of being developed.

3.2.11 The Electrical Connection route would cross the River Darent, a tributary which feeds into the River Thames. The Dartford Marshes Local Wildlife Site (LWS) is a large area of marshland
3.3 Description of Proposed Development

Riverside Energy Park

3.3.1 As set out in Chapter 1, the primary components of REP would comprise:

- an Energy Recovery Facility (ERF);
- an Anaerobic Digestion facility;
- a Solar Photovoltaic Installation;
- Battery Storage; and
- Enabling infrastructure for Combined Heat and Power to the site boundary to provide for a potential future local district heating (DH) pipe connection.

3.3.2 The REP site would also incorporate other infrastructure required to operate the facility including, but not limited to, ramps, parking, stores for supplies and office/welfare provision.

Energy Recovery Facility (ERF)

3.3.3 ERFs are industrial facilities which utilise thermal treatment technology (combustion) to process various types of waste. The treatment process is combined with boiler and steam turbine technology to enable the generation of electricity. The combined processes produce further outputs including heat, an ash from the combustion process known as Incinerator Bottom Ash (IBA), and residues from integral processing of emissions to control air pollution, known as Air Pollution Control Residues (APCR). Electricity generated is normally exported to either local distribution or national electricity networks, after utilising electricity that is used to run the plant itself.

3.3.4 The ERF at REP would normally treat Commercial and Industrial (C&I) waste, with the potential to accept municipal solid waste (MSW). Both categories would be non recyclable waste. The facility would likely be 'two stream', meaning that two separate 'lines' of waste treatment would occur, allowing for maintenance to be undertaken on one line whilst the other continues to operate fully.

3.3.5 Each line would consist of separate waste combustion grates, boiler and steam systems, combustion air systems, flue gas treatment facilities and ancillary equipment. The two lines would share a waste reception 'tipping' hall, waste storage bunker, ash collection and storage system, emissions control system, steam turbine, electrical generator and transformer, air cooled condenser, as well as a common process control system. Each line requires a stack (note that RRRF is a single outer enclosure with 3 inner flues, one for each of its lines). In total, for the purposes of assessment, the ERF would be able to treat a maximum throughput of waste up to 805,920 tpa, whilst the nominal design throughput would be lower (655,000 tpa). Note that the maximum throughput has been assumed for conservative assessment in the Environmental Impact Assessment (EIA).

3.3.6 The Main REP Building would house the ERF, key components of the Anaerobic Digestion facility (to conform with technical and operational design requirements, the gas flare and gas storage would be located separately outside), the battery storage, and accommodate solar photovoltaic panels on the roof. However, the majority of the Main REP Building would provide for the ERF’s thermal treatment process.
3.3.7 To facilitate optimum access for river and road deliveries and to offer the most advantageous logistics for the accommodation of the various components of REP, the Main REP Building would be orientated with the waste reception/tipping hall and bunker sited towards the southern boundary of the REP site and the stack towards the northern boundary. The REP site layout also presents the best option to minimise modifications to the existing site infrastructure thus ensuring the integrity of operations of RRRF during the construction of REP. Further information on how the general orientation was determined and is provided in Chapter 5 Alternatives Considered.

3.3.8 Plate 3.1 on the following page presents an indicative schematic through one line of an ERF showing the principal components of the treatment process. The numbers in the schematic are used in the description that follows.
Plate 3.1 Indicative Schematic of an ERF

<table>
<thead>
<tr>
<th>Fuel reception and storage</th>
<th>Combustion and boiler</th>
<th>Flue gas treatment</th>
<th>Energy recovery</th>
<th>Residue handling and treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Tipping hall</td>
<td>5 Feed hopper</td>
<td>12 Ammonia Injection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Shredder</td>
<td>6 Ram feeder</td>
<td>13 Semy-dry reactor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Solid fuel bunker</td>
<td>7 HZI grate</td>
<td>14 Fabric filter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Solid fuel crane</td>
<td>8 Primary air</td>
<td>15 Induced draft fan</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9 Secondary air</td>
<td>16 Silencer</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>10 Five-pass boiler</td>
<td>17 Stack</td>
<td></td>
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<tr>
<td></td>
<td>11 Economiser</td>
<td></td>
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<td></td>
<td></td>
<td>18 Turbine</td>
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<tr>
<td></td>
<td></td>
<td>19 Turbine building</td>
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<td></td>
<td></td>
<td>20 Air cooled condenser</td>
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<td></td>
<td></td>
<td>21 Transformer</td>
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<td></td>
<td></td>
<td>22 Bottom ash conveyer</td>
<td></td>
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<td></td>
<td></td>
<td>23 Bottom ash bunker</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 Bottom ash crane</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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(1 & 2) Tipping Hall and Shredder

3.3.9 A single waste reception area, comprising a tipping hall and shredder, with a ramp to access the tipping hall, would be a shared facility between the ERF and Anaerobic Digestion facility, integrated into the Main REP Building.

3.3.10 The tipping hall would be elevated to c. 3m Above Ordnance Datum (AOD) to meet the requirements of a Flood Risk Assessment (FRA) and would be accessed by a purpose built ramp. The tipping hall would be sized and designed to accommodate the range of manoeuvring expected of the delivery vehicles whilst maintaining a safe working environment.

3.3.11 The tipping hall would have a number of tipping bays to allow simultaneous tipping of waste and control over the location of deposition of waste into the bunker. The tipping hall would also facilitate the separate deposition of food and green waste into the Anaerobic Digestion facility bunker.

Plate 3.2: RRRF Waste Reception and Tipping Hall

3.3.12 Waste delivery trucks reverse into an assigned tipping bay and unload their waste into the bunker. The tipping hall is ventilated by drawing air and supplying it into the ERF combustion process. The resulting negative pressure within the tipping hall ensures that dust and odour are prevented from leaving the interior.

3.3.13 The tipping hall would be provided with sufficient safe areas for the inspection of waste deliveries and for the potential quarantine of waste that is considered unacceptable.

(3 & 4) Waste Bunker and Cranes

3.3.14 A single waste storage bunker is used for both lines. Overhead cranes (duty and stand-by allowing for redundancy) feed the hoppers with waste ready for later stages of the process, keeping the area behind the tipping bay free of waste and able to receive new waste. The crane also mixes the waste in the bunker to achieve a uniform heating value and thus helps to support the efficient and smooth operation of the facility.
3.3.15 Two cranes would typically be installed at the same elevation inside the waste bunker. An opening to the side of the bunker building allows the grab of either crane to be lowered to the tipping hall ground for repair or maintenance purposes.

Plate 3.3: RRRF Waste Bunker, Crane Gantry and Hopper

3.3.16 The cranes are equipped with a load measuring system to record waste feed rates and to automatically aggregate the weight of the waste fed to the hopper.
(5 & 6) Feed Hopper and Ram Feeder

3.3.17 Waste is deposited into the hopper to a vertical feed chute from which the ram feeder discharges waste onto the grate for combustion. The feed chute ensures that the waste is delivered continuously onto the grate. Waste is not introduced onto the grate until the minimum combustion temperature of 850 degrees Celsius (°C) is achieved in the combustion chamber in accordance with the Industrial Emissions Directive (IED).

Plate 3.5: RRRF Waste Feeding Hopper

(7, 8 & 9) Grate and Primary/Secondary Air

3.3.18 An air cooled moving grate system facilitates thermal treatment of the waste through combustion. Combustion occurs at temperatures in excess of 850 °C. Air is taken from the waste bunker and tipping hall and used as Primary Air in the combustion process, which ensures that any odour is combusted within the facility and dealt with. The combustion process is controlled to ensure the combustion gases are within stringent emissions limits imposed under the IED.

3.3.19 The grate incinerates the waste, ensures a continuous combustion and a good burnout rate. The grate sits on an incline towards the end at which the IBA leaves the combustion unit.

3.3.20 Within the upper part of the combustion chamber there are also auxiliary burners which are used: (1) to heat the combustion chamber before waste is introduced onto the grate; (2) for increasing the combustion chamber temperature if it drops towards the minimum temperature of 850°C; and (3) maintaining the minimum temperature in the combustion chamber until all waste is combusted when shutting down.
3.3.21 Waste heat treatment is managed by a combustion control system (CCS). The CCS allows a largely automatic and secure operation.

Plate 3.6: Typical Combustion Chamber and Grate

3.3.22 Primary air is drawn in from the waste bunker and delivered by a fan to the underside of the grate. A secondary air system delivers and regulates the secondary combustion air above the grate to the flue gases.

3.3.23 The angle of injection of the secondary air causes a swirling airflow in the combustion chamber. Due to this mixing the flow is homogenised with respect to temperature, velocity and concentrations.

(10, 11 & 12) Boiler, Economiser and Ammonia Injection

3.3.24 Hot combustion gases are passed through the boiler and economiser to produce superheated steam. In the economiser system, the water supplied from the feed water tank is heated up to a temperature close to the boiling temperature. In the schematic in Plate 3.1 the steam boiler consists of five passes, some vertical and some horizontal, each with a given purpose, including cooling down the incineration chamber. High pressure steam is produced in the boiler during normal thermal operation.

3.3.25 Intermediate and low pressure steam would also be available for export following partial expansion through the steam turbine, which increases thermal cycle efficiency. Uses would include internal consumption within the ERF such as feed water preheating, and export to facilitate combined heat and power (CHP) including anaerobic digestion process heating and potentially DH.
3.3.26 A water system prepares and supplies water to the feed water tank of the boiler and covers the losses of boiler feed water due to steam, condensate and blow down losses. Typically, the only input to the boilers is on the first fill, as water remains in a closed loop. Ammonia (NH₃) is added at various positions in the first and second stage passes to ensure that the gases from the process are within environmental limits.

**Flue Gas Treatment (FGT)**

3.3.27 To ensure that the combustion gases from the ERF meet the stringent requirements of the IED, they would be treated prior to emission to atmosphere via the stack. Combustion gases will first be maintained at a minimum temperature of 850°C for a residence time of at least two seconds in the combustion chamber to ensure that dioxins and furans are destroyed in accordance with the IED.

3.3.28 The furnace would be configured and designed for staged combustion to minimise the formation of oxides of nitrogen (NOₓ). Further systems would achieve abatement of NOₓ and other emissions to meet the IED and the requirements of the Environmental Permit.

3.3.29 After combustion, flue gases would be rapidly cooled in the boiler to minimise the risk of dioxin reformation. Flue gases would then be discharged to the flue gas treatment (FGT) facility for further treatment using lime and powered activated carbon (PAC) to reduce the levels of acid gases, dioxides, volatile organic compounds, mercury and other trace metals.

3.3.30 Bag filters would be used to remove particulate matter including fly ash and other residues from the FGT process. Solids from the process would be collected in filter hoppers and discharged to collecting silos.

3.3.31 The FGT process is continuously monitored and controlled automatically via the central control room. Any deviations from the environmental limits are immediately alarmed and automatically corrected.

*Plate 3.7: Typical Bag Filter House*
Plate 3.8: Typical bag filter penthouse

(17) Stack

3.3.32 One flue per line is used to discharge the cleaned flue gases to the atmosphere. Emissions are monitored continuously 24 hours per day 365 days per year to ensure that the emissions are within permitted environmental limits. Emission levels would be regularly reported to the EA in line with an Environmental Permit (EP). Underneath the flue gas inlet to the stack, condensed water vapour and rain water is collected and discharged via a condensate pipe.

(18 & 19) Turbine & Turbine Building

3.3.33 The steam generated in the boiler is transferred to the turbine. The turbine transforms the thermal energy of the high pressure steam into a rotary motion, which drives a generator to produce electrical power.
(20) Air Cooled Condenser

After generating electricity the residual (turbine exhaust) steam is condensed in an air cooled condenser and collected as condensate for re-use within the facility. The turbine exhaust is maintained below atmospheric pressure to maximise efficiency and power generation. A quantity of intermediate and low pressure steam is extracted from the turbine for low grade heat uses (as described in 3.3.25) to maximise thermal cycle efficiency.
(21) Transformer

3.3.34 The transformer is located with the onsite substation and increases the voltage for efficient distribution onwards within the local network.

(22-24) Bottom Ash Conveyor, Bunker and Crane

3.3.35 Ash created from the combustion of waste (IBA) is collected on a conveyor system and transferred to an ash bunker ready for collection and removal. IBA is temporarily stored in the ash bunker and loaded into purpose-built sealed ash containers which are transported to the riverside jetty ready for loading onto barges for transport to the existing ash processing facility which is located at the Port of Tilbury.

3.3.36 At the ash processing facility any metal present in the IBA is removed for recycling. The IBA is then screened by size and used as secondary (replacement for natural material) aggregates in the construction industry. Typical re-uses of IBA as secondary aggregate include road construction filling material.

3.3.37 APCR is produced through the flue gas treatment process in the bag filters. The APCR is transferred into sealed silos for storage ready for collection and removal. The APCR has a consistency of powdered cement. It is taken off-site in tankers for recycling at specialist treatment facilities.

3.3.38 Lime, aqueous ammonia and Powdered Activated Carbon (PAC) are three key consumables in the ERF process. They are stored in tanks or silos with new supplies delivered as required in lorries.
3.3.39 Anaerobic digestion processes food and green waste in the absence of oxygen. Through the degradation of waste by natural organisms, biogas is generated as a useful byproduct, along with a digestate in liquid and solid forms. Subject to suitable treatment by “maturation”, the solid digestate would be used as an agricultural fertiliser, or where a suitable end user is not available (or the solid digestate is unsuitable), it can be processed by thermal treatment in the REP ERF.

3.3.40 A typical anaerobic digestion process consists of the following components shown on the schematic in Plate 3.12. References below relate to those in the Plate.
3.3.4.1 A ventilation / air collection system would be present for all buildings used in the process. Due to the integrated nature of REP the waste air and odours from the anaerobic digestion process
can be fed directly into the ERF waste bunker, where they are then drawn in as primary air for the ERF combustion process, thus controlling and containing odours.

3.3.42 The digester would run continuously 24 hours per day, 365 days per year and would convert organic waste into a constant and high quality stream of biogas for subsequent gas upgrading to natural gas (CNG quality vehicle fuel or for utilisation in Combined Heat and Power (CHP) production). The digester process converts nearly 100% of the anaerobically degradable matter of the organic input material into biogas. Ordinarily, when subject to appropriate additional processing, the material discharged from the process is a high quality compliant solid compost (e.g. PAS100 compliant). This is ideally suited for use as fertiliser.

3.3.43 The digester process is able to accept mixed food and green waste. All organic materials including related impurities which are fed into the digester are discharged continuously, i.e. no planned stoppage and/or opening of the digesters is required for maintenance or sediment clean out. All components requiring maintenance (bearing, sealing, gearbox, etc.) are accessible from outside. All digester process steps are fully enclosed ensuring that, notwithstanding emergency biogas release via overpressure protection systems, all emissions of greenhouse gases and odours, as well as noise, are kept to an absolute minimum.

**Waste Reception and Handling**

3.3.44 The organic material delivered would be directed to REP’s shared tipping hall to a dedicated tipping bay for discharge into the organic waste bunker. The bunker would serve as intermediate storage for organic waste feedstock. An automated crane would feed the waste into the processing area where it would be shredded and screened to ensure that only small pieces are passed to the digester. The pre-treated material would then be transported to the digester via conveyor belts and screw conveyors. Any material from this process, that is unsuitable for the anaerobic digestion process (remnants of plastic bags for example), can be fed into the ERF.

**The Digester**

3.3.45 The pre-treated organic material is fed directly into the digester. If required, the waste is moistened to ensure a uniform and optimal water content. This can be achieved, for example, by collected rainwater and/or service water from a tank. In addition, inoculum (a live microorganism) recirculated from the digester outlet can be fed to the inlet in order to stabilise and kick start the digestion process of the fresh material.
3.3.46 An integrated heating system would ensure that the process temperature is reached rapidly and is constantly maintained. Due to the integrated nature of REP, heating could be provided by low pressure steam supplied from the ERF turbine, thereby lessening reliance on imported electricity / fossil fuels. In order to minimise heat losses, the digester tank is fully insulated and can be installed outdoors in a weatherproof housing.

3.3.47 The digestion process is based on anaerobic-thermophilic digestion above ambient temperature. Any unwanted seeds, germs and micro-organisms are reliably eliminated inside the gas-tight digester. The temperature inside the digester, filling level, gas production and gas pressure are constantly monitored, resulting in consistent and constant high gas yields.

**Digestate Drying and Storage**

3.3.48 Liquid digestate from the digester is pumped to a belt dryer. The dryer would utilise steam from the ERF process. The mixed steam / hot air exiting the dryer would be returned into the combustion process of the ERF. This would ensure neutralisation of possible odours. The dried digestate is then stored in on-site buffer storage, waiting for its transportation to final users or to an additional maturation location for ensuring compliance to standards that are required before use in agriculture.

**Biogas Storage, CHP Engine and Flare**

3.3.49 Where gas is not processed to produce CNG, the pre-treated biogas is fed to CHP unit(s). The generated electrical power is added into the site network while the excess heat can be used for digester heating and for drying of the digestate, or as additional heat available for local district heating.

3.3.50 A gas flaring system ensures that any excess biogas is combusted (e.g. when biogas utilisation is stopped or in case of an emergency). This ignition occurs fully automatically as part of a three tier pressure protection system.
Digestate Storage

3.3.51 The dried digestate is taken from the discharge point of the dryers by shovel loader and filled into boxes for its storage prior to further transportation and / or maturation if needed. The exhaust air of the boxes is collected and fed back to the dryer.

3.3.52 Waste air from the storage area is taken as process air for digestate drying and later directed into the combustion process of the plant to ensure that odour does not escape.

Solar Photovoltaic

3.3.53 Solar panels would be located on the Main REP Building roof areas. Initial studies demonstrate that high specification photovoltaics (PV) modules would be capable of generating up to 1.2 Megawatts (MWe), depending on the building form chosen. Inclusion of solar PV generation will increase renewable energy generated from REP which can also be used to offset power required to run the facility as a whole.

3.3.54 Solar photovoltaic modules convert solar radiation directly into electricity in a silent and clean process that requires no moving parts. Solar radiation falling onto semiconductor cells generates electron movement, resulting in direct current (DC) power output. A mounting system would ensure that the photovoltaic modules are securely attached to the roof at a tilt angle optimised to maximise power generation.

3.3.55 Inverters are required to convert the direct current output from the photovoltaic panels into alternating current (AC) for connection to the distribution network (to combine with other on-site generation or energy storage, via a step-up transformer). A step-up transformer would transform the output from the inverters to the required distribution voltage.

Battery Storage

3.3.56 The battery storage facility of REP would supply additional power to the offsite distribution network at times of peak electrical demand. This facility would be integrated into the Main REP Building. The battery storage system would increase the operational performance and reliability of REP and provide an enhanced balance of supply and demand. Such energy storage benefits the entire power value chain from generation, transmission and distribution to all users.

3.3.57 The battery storage facility would also provide a stand-by generation capability during times when the ERF is not operating (e.g. during routine shut down periods).

3.3.58 The battery storage facility would be charged during low power demand periods directly from the energy produced from the ERF, solar photovoltaic panels and the AD CHP engine (if installed) and stored for supply into the electricity distribution network.

3.3.59 The REP system would likely be a modular battery system consisting of a suitable number of (typically 1 MWe capacity) containers connected to AC/DC converters and electrical transformers. This approach would minimise the use of space and reduce installation time. Batteries, controls, protection cabinets and transformers are all contained in a single module. The converters and transformers would be located at ground floor level, but above maximum flood risk level.
The batteries would be designed to allow for multiple cycles of charge and discharge per day. The charging, discharging and monitoring systems would be fully integrated into overall REP control and management systems.

**CHP Infrastructure**

3.3.1 ‘CHP-Ready’ is a recognised term under the EA’s CHP-Ready Guidance and means a plant which is initially configured to generate electrical power only, but which is designed to be ready, with minimum modification, to supply heat in the future (i.e. to a DH. network). REP will be constructed to a level of ‘readiness’ where the plant is fully capable of exporting heat, with all required infrastructure in place, and is synonymous with being ‘CHP from the outset’, which the Applicant has referred to as being ‘CHP-Enabled’.

3.3.2 REP would include all the necessary infrastructure within the REP site (heat exchangers, pumps, pressurisation system). A dedicated and integrated heat supply system would also be provided to support the anaerobic digestion process. The heat supply system would be included to potentially export up to 30 MWt of heat to offsite consumers.

3.3.3 Typically a District Heating (DH) network transfers steam heat to a closed hot water circuit via a series of heat exchangers. This would supply hot water to offsite consumers through a pre-insulated buried pipeline, before being returned to REP for reheating. This technology is well proven and highly efficient. The REP proposal would include the CHP-Enabling infrastructure and the export/return pipes to be installed to the site boundary so that the infrastructure is ready should a future end user be identified, such as the developer of a new housing development. The Applicant is in discussions with relevant local authorities and developers to explore opportunities for connecting to REP. A CHP Feasibility Report, identifying potential end users, is being prepared and will accompany the Application.
The DH pipes for REP would be approximately 500-600 mm in external diameter including high performance insulation to minimise heat losses. Subject to verifying offsite heat demands and location(s), one pipe would be for the export of water at a temperature of around 90°C, and one would be for the return water at a temperature of around 60°C, after heat has been extracted. The pipes would be buried below ground, with around 600 mm cover, and would be spaced close together.

**REP Site Ground Levels and Site Clearance**

3.3.4 Existing ground levels on the REP site vary in the order of 1.7 m to 2.5 m AOD and therefore the ‘average’ ground level is in the order of 2-2.2 m AOD. Ground levels would be modified where appropriate to accommodate the development. On the basis of the above, for the purposes of the assessment, it has been assumed that finished ground levels on the REP site would be between 1 m and 3 m AOD.

3.3.5 No significant changes in level from existing would be expected on the REP site, other than as localised ramping to achieve the lower and upper limits set out above. The minimum level of flood sensitive components of REP would be set to at least 2.97 m AOD, as proposed to the EA in consultation to date.

3.3.6 Some structures and buildings currently exist on the REP site and on the Main Temporary Construction Compound. Where necessary, these would be demolished/removed to facilitate construction or use as a temporary site.

**Jetty**

3.3.7 The import of waste and export of IBA from the ERF would predominantly be undertaken via the existing jetty that serves RRRF. The parameters for consideration within this PEIR include river/road split of up to 100% by road (a Navigational Risk Assessment will also consider river scenarios and will be submitted with the ES). The existing jetty has sufficient capacity to support this throughput to REP (up to 805,000 tpa maximum) without modification.

3.3.8 Deliveries and exports from the jetty would be made using standard ISO containers lifted off/on barges by the existing cranes. Containers are sealed so that no incoming waste or outgoing IBA can escape into the surrounding area. No river works are proposed to facilitate the increased throughput of the jetty during the construction or operation of REP.

3.3.9 The jetty currently receives waste from four upriver Waste Transfer Stations (WTS) which are located in Central London. IBA is exported downstream to Tilbury. It is expected that future contracts will continue to use the same fundamental river network. Further details on transportation assumptions are provided in the Transport Chapter.

3.3.10 During construction the Applicant would seek to make use of the existing jetty and ISO containers to deliver construction materials where possible to reduce the number of deliveries by road.

**Electrical Connection**

3.3.11 REP would be connected to the existing electricity distribution network via a new 132 kilovolt (kV) distribution connection (‘the Electrical Connection’) by UK Power Networks (UKPN). It is proposed that the Electrical Connection would be routed predominantly via the existing road network and would be underground, except for the connection point with REP itself, and at the connection point to the distribution network operator (DNO). This connection would necessarily require a new substation within the REP site. However, the connection to the distribution system would be installed in an existing substation building with no external alteration required. Littlebrook is the most suitable connection point for REP, as outlined in Chapter 5 Alternatives Considered. The Electrical Connection would comprise a new part of that network, to be owned and operated by UKPN.
3.3.12 Electrical Connection route options have been included within the Indicative Application Boundary (Figure 1.3, Appendix A.1). Selection of a single Electrical Connection route will be confirmed in partnership with UKPN, who are undertaking detailed engineering studies. The decision on a chosen route will take account of their statutory obligations under the Electricity Act (to develop an efficient, co-ordinated and economical system) as well as the responses received from statutory consultation. A single route to the Connection Point will ultimately be included within the subsequent DCO application.

3.3.13 The Electrical Connection would comprise a trefoil of cables (3 cables laid together to comprise a single 3-phase circuit), buried in a cable trench typically 450mm wide and 900mm deep (except where there is potential for directional drilling or localised deeper trench to be required to pass below a specific constraint) when laid under highway footways and carriageways, with jointing pits approximately every 500 m along the route. The proposed cable route (and route options) would generally follow existing carriageway routes.

3.3.14 Where works are undertaken along footpaths and verges, a 3 m wide working corridor would be likely and generally be expected to cause some encroachment of the works area onto the highway. Where the proposals require works within the highway carriageway, a lane closure would be required. Depending on the width of the chosen highway route, a lane closure for the working area would typically require:

a. On dual carriageways - a reduction from two lanes to one along one of the carriageways; and

b. On single carriageways – traffic signals to control single lane traffic working.
3.3.15 Depending on specific local constraints, single lane closures may be required in certain circumstances. However, seeking to minimise or where possible eliminate potential temporary road closures is a key part of the Applicant’s and UKPN’s decision-making process to determine a preferred cable route.

3.3.16 Due to the relatively limited working width required, public rights of way (PRoW) closures are considered unlikely, since temporary short diversions (approximately one week at a given location) would ordinarily be possible. Some highway footways may require temporary diversion or closure whilst works are being undertaken.

3.3.17 When trenching works are being undertaken it is expected that a length of up to 200 m would typically be dug up to facilitate duct laying. Longer lengths of excavation are avoided by the commitment from UKPN to use a ducted cable system. This allows relatively short lengths of ducting to be installed and long cable lengths to be pulled through later between jointing pits.

3.3.18 It is expected that a typical trench length would be open for around 5 days and that this would be on a rolling basis along the length of the route. The location of jointing pits would need to be determined by subsequent detailed design. Their location would depend on the maximum length the cables can be pulled which will depend on the number of bends and cable drum lengths. Joint pits may need to be accessed, with an associated working area, to install and joint cables. The expected time for such an installation would be approximately 5 days. Typical machinery used in a working area would include pneumatic breakers, lorries and excavators.

3.3.19 UKPN continue to undertake more detailed engineering studies to understand the exact locations of other utilities and potential constraints. Therefore, at a limited number of locations, there would still be the potential requirement for alternative civil engineering other than open trenching. This might include localised Horizontal Directional Drilling (HDD) or the installation of cables under or over an existing structure. This is most likely to occur at railway crossings, waterways or similar structures where trenching is not possible. The location of such potential works is expected to be refined to a specific list prior to submission of the application.

3.3.20 At Littlebrook substation the connection point will be fitted to an existing gas insulated switchgear (GIS) which has already been constructed. Works around the substation will consist of the installation and connection of 132kV cables.

Temporary Construction Compounds

3.3.21 Two forms of Temporary Construction Compounds would be required, namely the Main Temporary Construction Compounds and the Cable Route Temporary Construction Compounds.

3.3.22 The Main Temporary Construction Compounds would be located on the western side of Norman Road, to the south of the REP site. The land has been previously developed. The Main Temporary Construction Compounds would be used as a laydown area, including as a delivery reception and consolidation point for construction materials, equipment, for assembly/fabrication and for associated welfare. It would also provide a site for satellite welfare facilities for the main REP site. The use of the laydown area would potentially reach a peak towards the middle of the overall construction programme.

3.3.23 Some of the Main Construction Compounds already have hard standing, however additional hard standing fill (i.e. a compacted imported fill) may be required to ensure the integrity of the site for laydown purposes.

3.3.24 On completion of the construction phase, any compacted fill installed to provide a hardstanding would be removed.

3.3.25 Cable Route Temporary Construction Compounds would be required to provide small scale localised storage of materials and mobile welfare whilst the Electrical Connection route is being
constructed. These would be required where materials cannot be delivered direct to the working area. Due to the potential route options, working arrangements (in terms of ducted lengths, joint pit location and number of operational gangs) and extent of direct-to-site deliveries, it is not possible at this stage to identify the specific location of the Cable Route Temporary Construction Compounds.

3.3.26 More information is expected to become available on the proposed Cable Route Construction Compounds and their potential location following statutory pre-application consultation and the completion of UKPN engineering studies.

### 3.4 Rochdale Envelope and Parameters For The Assessment

#### Rochdale Envelope

3.4.1 The detailed design of REP will be determined post-consent once the Applicant has appointed a contractor(s) (as is usual with infrastructure projects of this type and scale). The draft DCO to be submitted with the DCO application will include a Requirement for details of the final design to be submitted and approved by the relevant planning authorities prior to construction. The assessment of the Proposed Development is therefore based on a set of parameters, a ‘Rochdale Envelope’.

3.4.2 PINS Advice Note Nine: Rochdale Envelope (April 2012) (Version 2) sets out advice for using the Rochdale Envelope approach for the assessment of Nationally Significant Infrastructure Project applications.

3.4.3 The PEIR sets out the preliminary findings of an assessment of the Rochdale Envelope and the key parameters as described further below.

3.4.4 In order to provide a robust assessment, each topic specific assessment presented in [Chapters 6 - 14](#) has been undertaken on a reasonable worst case scenario for that given topic. The reasonable worst case scenario for each topic differs, and the chapters set out the scenario for that topic, however all assessments have been undertaken within the broadest reasonable parameters.

#### Parameters for the Assessment

3.4.5 Maximum heights have been assumed for particular components as set out below in Table 3.1.

<table>
<thead>
<tr>
<th>Building, structure, component</th>
<th>Maximum height AOD</th>
<th>Parameter Colour on Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Process Building</td>
<td>65m</td>
<td>Red</td>
</tr>
<tr>
<td>Anaerobic Digestion (where external to Main Process Building)</td>
<td>43m</td>
<td>Green</td>
</tr>
<tr>
<td>Other Integral Process Buildings</td>
<td>38m</td>
<td>Blue</td>
</tr>
<tr>
<td>Stacks</td>
<td>113m</td>
<td>Magenta</td>
</tr>
</tbody>
</table>

3.4.6 Current Parameter plans are included in [Figure 3.1 and 3.2, Appendix A1](#). These show the potential location assumed for the primary above ground visible infrastructure components that would comprise REP. These parameters have been used, where relevant, to inform the assessments in the topic specific chapters of this PEIR. No maximum/minimum length or width parameters have been assumed in the assessment and therefore the maximum ‘volume’ of development within the parameters is assumed where appropriate.
3.5 Construction and Commissioning

3.5.1 Should consent be granted in 2020, it is anticipated that construction and commissioning of REP would commence in 2021 and be completed in 2024, with a construction period of up to 36 months.

Riverside Energy Park Site

3.5.2 All works within the REP site would be undertaken by the Applicant and their appointed contractors, except the export cable from the high voltage side of the onsite substation, which would be undertaken by UKPN or their appointed contractor as part of their Electrical Connection. The works on the REP site would be expected to take c. 36 months for construction plus commissioning and reliability testing thereafter.

3.5.3 In order to provide mitigation against potential odour and pests during commissioning (if the ERF is not yet operating in parallel), the anaerobic digester would be fully enclosed to contain odour. Handling of organic materials (reception, pre-treatment, intermediate storage, digestate post-treatment, etc) would take place in closed and ventilated halls, thereby minimising odour emissions.

3.5.4 There is potential for biogas emissions from the digester vessel (via overpressure protection devices) during commissioning when the process is in a transient condition, but this would represent an abnormal circumstance.

Electrical Connection

3.5.5 The construction period for the Electrical Connection route is estimated to be up to 18 – 24 months, consisting of a rolling programme along the route. The works at Littlebrook 132kV substation are estimated to take less than two weeks to install 132kV cables and connect the cables to the switchgear.
Table 3.2 Indicative construction and commissioning programme

<table>
<thead>
<tr>
<th>Year</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
</tr>
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<tbody>
<tr>
<td>Quarter</td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
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<td></td>
<td>Q1</td>
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<td></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
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<tr>
<td>Main REP site construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main REP site commissioning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Connection construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Connection commissioning</td>
<td></td>
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</tbody>
</table>
3.5.6 The period for construction of the Electrical Connection route would depend on the number of construction work areas installing ducting and cabling at the same time along the route. If multiple working areas were undertaken simultaneously, these would be sufficiently far apart to avoid accumulating any effects that might arise. It is expected that there would be no more than two working areas active at the same time.

3.6 Operation

3.6.1 The plant would be fully operational from 2024 onwards (subject to grant of DCO).

Workforce

3.6.2 The operation of REP would generate a minimum of 75 full time equivalent (FTE) jobs comprising operations, jetty/site operations, engineers, technicians/fitters, stores operatives and financial/admin staff.

Access and On-site Vehicle Movements

3.6.3 The main and only highway access to REP would be via Norman Road from the existing highway network and would be shared with RRRF. Norman Road provides access directly to a dual-carriageway highway used by other industrial uses in the area, including significant distribution facilities.

3.6.4 Access from the River Thames will be via the existing jetty which is currently used for RRRF. Onsite vehicles will transport sealed containers carrying construction materials and waste during operation from the jetty into the Main REP Building. IBA outputs will be transported in sealed containers back to the jetty for transporting via the River Thames.

3.6.5 Primary pedestrian access to REP will be via Norman Road and the PRoW network.

3.6.6 Indicative onsite traffic management predominantly utilise a one-way system with turning movements tested through swept path analysis. Some amendments would be made to the northern end of Norman Road to facilitate a revised arrangement on entering the REP site.

3.6.7 To inform the assessments, waste delivery scenarios of 100% by road and 100% by river will be considered and are discussed in more detail in the relevant topic-specific chapters of this PEIR.

3.6.8 The Main Construction Compounds would be accessed directly from Norman Road with one or more new access points required depending on the final footprint and location of the compound within the Indicative Application Boundary.

Maintenance, Start-up and Shutdown

3.6.9 The ERF would be designed to operate for a minimum of 8,000 hours per year. Typically, each boiler line would undergo one planned minor outage (approx. 7 days in duration) and one planned major outage (approx. 14 days in duration) per year, which can be conducted without taking the entire plant offline. Statutory inspections on common plant (necessitating a full shut down for approx. 3 days) are required at least every two years. Additionally, the turbine and generator are taken out of service for up to 8 days per year for inspections and maintenance.

3.6.10 The waste bunker is sized to accommodate c.7 days storage capacity when operating at nominal throughput. This is sufficient to allow waste to be stockpiled in a controlled manner for anticipated maintenance periods. In the very rare event of an extended outage, waste volumes
would be managed through the logistics network and, if required, diverted to other waste disposal/treatment facilities temporarily.

3.6.11 The anaerobic digestion facility would remain in operation for the entirety of its design life once commissioned. All components requiring maintenance would be accessible from outside of the digester. All ancillary systems (material handling, ventilation, gas upgrading etc) are designed to be capable of being maintained without disrupting the anaerobic digestion process.

3.6.12 Battery storage would remain in operation for the entirety of its design life, operating intermittently but frequently to suit generation output and peak demand.

3.6.13 The roof mounted photovoltaic panels would remain in operation for the entirety of their design life and would only require occasional cleaning.

3.7 Decommissioning

3.7.1 At the end of the operational life of REP, the generating equipment would be removed once the plant had ceased operations permanently. Any decommissioning phase is assumed to be, at worst, of a similar duration to construction (minus the commissioning activities), and therefore environmental effects are considered to be of a similar level to those during the construction phase.

3.7.2 If the Electrical Connection route was decommissioned then ducting would be left in-situ. Cabling may be removed or disconnected (made safe) and left in-situ.