

# The Keadby 3 Low Carbon Gas Power Station Project

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**The Keadby 3 (Carbon Capture Equipped Gas Fired Generating Station) Order**

**Land at and in the vicinity of the Keadby Power Station site,  
Trentside, Keadby, North Lincolnshire**

## Environmental Information Response to Section 51 Advice

**The Planning Act 2008**

**The Infrastructure Planning (Environmental Impact Assessment)  
Regulations 2017**

**Applicant: Keadby Generation Limited**

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## GLOSSARY

<b>Abbreviation</b>	<b>Description</b>
CCGT	Combined Cycle Gas Turbine
CCP	Carbon Capture Plan
CCS	Carbon Capture and Storage
CEMP	Construction Environmental Management Plan
DEMP	Decommissioning Environmental Management Plan
EWC	European Waste Code
FEED	Front-End Engineering Design
SNRHW	Stable non-reactive hazardous waste
SWMP	Site Waste Management Plan

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## 1.0 WASTE MANAGEMENT TECHNICAL NOTE

### 1.1 Introduction

1.1.1 An application for Development Consent for the Keadby 3 Low Carbon Gas Power Station Project was received by The Planning Inspectorate (who acts on behalf of the Secretary of State) on 1 June 2021 and accepted for examination on 28 June 2021.

### 1.2 Scope

1.2.1 This Technical Note provides additional environmental information in relation to matters raised in advice provided to the Applicant at the point of acceptance of the Application. The scope of the Technical Note comprises:

- Section 2 provides an estimate of the types and quantities of waste generated by the Proposed Development during construction, operation and decommissioning;
- Section 3 provides a description of the waste treatment and disposal facilities that may be available to manage these wastes;
- Section 4 considers the potential impacts of waste from the Proposed Development on regional and national waste management capacity; and
- Section 5 provides an assessment of the ancillary effects of waste management associated with the Proposed Development such as increases in noise and other pollutants where these are not already covered in technical chapters of the Environmental Statement (**APP-051 – APP-063**).

1.2.2 This technical note is accompanied by **Figure 1** which illustrates the locations of potential landfill sites that may accept the wastes set out in this Technical Note.

## 2.0 WASTE GENERATION

### 2.1 Construction

2.1.1 **Chapter 5:** Construction Programme and Management of the Environmental Statement (**APP-048**) includes information on the anticipated construction programme, timings and methods of working, where available. Taking this information into consideration, it is envisaged that construction waste will comprise:

- surplus excavated material from earthworks and construction of foundations;
- construction waste including consumables, packaging and surplus or damaged materials; and
- waste from site offices and staff welfare facilities.

2.1.2 Table 1 below summarises the main construction waste types and estimated quantities. There may be contaminated spoil identified during testing of the spoil generated in preparing the Proposed PCC Site. This would require segregation from the clean material and off-site treatment and disposal. The exact quantities are unknown but at this stage are not expected to be more than 10% of the total spoil arising shown in Table 1.

**Table 1: Construction Waste Arisings**

Waste Type	Source	Properties	Quantities <sup>1</sup>
Surplus excavated spoil	Site formation and piling	Uncontaminated spoil	13,795 m <sup>3</sup> (from piling) 65,000 m <sup>3</sup> (from earthworks)
Non-hazardous and inert construction waste	General construction activities, packaging from material deliveries, damaged/surplus materials etc.	Inert material (e.g. brick and concrete). Source-separated recyclables (paper & card, plastic, metals and wood). Mixed construction waste.	2,735 tonnes (2,735 m <sup>3</sup> , assuming bulk density of 0.32 t/m <sup>3</sup> )

<sup>1</sup> Densities taken from <https://www.sepa.org.uk/media/163323/uk-conversion-factors-for-waste.xlsx>

Waste Type	Source	Properties	Quantities <sup>1</sup>
Hazardous construction waste	Construction plant maintenance and use of chemicals.	Hazardous (e.g. surplus paint/coatings, batteries and oil filters)	<10 tonnes (50 m <sup>3</sup> , assuming bulk density of 0.27 t/m <sup>3</sup> )
Municipal waste	Site offices and staff welfare facilities.	Source-separated recyclables (e.g. paper, card, plastics) and mixed municipal waste.	640 tonnes (3,200 m <sup>3</sup> , assuming bulk density of 0.26 t/m <sup>3</sup> )
		<b>Total:</b>	<b>137,741 m<sup>3</sup></b>

## 2.2 Operation

2.2.1 **Chapter 4:** The Proposed Development of the Environmental Statement (**APP-047**) includes information on the raw materials and chemicals likely to be stored at the Proposed Development Site. Taking into account these process inputs, operational waste will comprise:

- waste from site offices;
- waste from the combined cycle gas turbine (CCGT) unit; and
- waste from the carbon capture plant (CCP).

2.2.2 Table 2 below summarises the main waste types and quantities. In accordance with the principles of the Rochdale Envelope, the quantities of waste from CCP operation identified in Table 2 are conservative estimates and the actual quantities arising may be smaller.

**Table 2: Operational Waste Arisings**

Waste Type	Source	Properties	Estimated Quantities
Municipal waste	Offices	Predominantly of paper, cardboard and plastic	3 tonnes per year
Industrial waste	General maintenance activities	Predominantly paper, cardboard, plastic and wooden packaging material; worn and damaged metal items;	12 tonnes per year

Waste Type	Source	Properties	Estimated Quantities
		various other materials such as stuffing box materials, gaskets etc; and a small amount of waste oil. Waste oil will be classified as hazardous waste, whereas the other waste is likely to be classified as non-hazardous	
Washing effluent	Gas turbine (CCGT plant)	High-concentration detergent	Less than 50 tonnes per event and only expected to be required once every 3-5 years
Cleaning & passivation effluent	Heat recovery steam generator (CCGT plant)	Liquid waste with low pH, high in suspended solids and Total Dissolved Solids (TDS) in the form of iron corrosion products.	20 tonnes per event and only expected to be required once every 3-5 years
Reclaimer sludge	Reclaimer (CCP plant)	Likely to be hazardous	< 1 tonne per hour (< 8,000 tonnes per annum)
Acid wash purge	Absorber (CCP plant)	Likely to be hazardous if pH < 2	< 5 tonne per hour (< 40,000 tonnes per annum)
Reflux purge	Stripper (CCP plant)	Potentially hazardous depending on composition	< 1 tonne per hour (< 8,000 tonnes per annum)
Ammonium sulphate effluent	CCP plant	Likely to be hazardous if pH < 2 – may have potential for beneficial use depending on presence of contaminants	< 1 tonne per hour (< 8,000 tonnes per annum)

## 2.3 Demolition

- 2.3.1 As explained in **Chapter 4: The Proposed Development (APP-047)** the power generation and carbon capture elements of the Proposed Development have a design life of circa 25 years and on this basis, decommissioning activities are currently anticipated to commence after 2051.
- 2.3.2 At the end of its operating life, it is anticipated that all above-ground equipment associated with the parts of the Proposed Development to be decommissioned will be decommissioned and removed from the Proposed Development Site. Prior to removing the relevant plant and equipment, all residues and operating chemicals will be cleaned out from the plant and disposed of in an appropriate manner.
- 2.3.3 The bulk of the relevant plant and equipment will have some limited residual value as scrap or recyclable materials, and the demolition contractor will be encouraged to use materials that could be recycled.
- 2.3.4 Prevention of contamination is a specific requirement of the Environmental Permit for the operation of the Proposed Development and therefore it is being designed such that it will not create any new areas of ground contamination or pathways to receptors as a result of construction or operation. Once the relevant plant and equipment have been removed to ground level, it is expected that the hardstanding and sealed concrete areas will be left in place. Any areas of the Proposed Development which are to be decommissioned that are below ground level will be backfilled to ground level to leave a levelled area.
- 2.3.5 A Decommissioning Plan (including Decommissioning Environmental Management Plan (DEMP)) will be produced within the period specified in the relevant legislation in force at the time of cessation of operations and agreed with the Environment Agency as part of the Environmental Permit and sites surrender process.
- 2.3.6 All decommissioning activities will be undertaken in accordance with the waste hierarchy. Materials and waste produced during decommissioning and demolition will be stored in segregated areas to maximise reuse and recycling. All materials that cannot be reused or recycled will be removed from the Proposed Development Site and transferred to suitably permitted waste recovery/disposal facilities. It is anticipated that a large proportion of the materials resulting from demolition will be recycled and a record will be kept in order to demonstrate that the maximum level of recycling and reuse has been achieved.
- 2.3.7 In the light of the control measures set out above that would form part of the proposed DEMP, decommissioning is not anticipated to present any significant environmental effects beyond those assessed in this Technical Note for the construction phase of the Proposed Development and are not assessed separately in this Technical Note.



## 2.4 Summary

- 2.4.1 The largest operational waste arisings would be from the CCP. It has been conservatively assumed at this stage in the project development that all wastes from the CCP will be hazardous and this technical note is based on that assumption. In the event that some of the CCP waste streams are non-hazardous, impacts of operational waste management at the Proposed Development will be lower than those presented in this technical note.

### 3.0 WASTE FACILITIES

#### 3.1 Regional Non-hazardous Waste Management Facilities

3.1.1 Inert and non-hazardous wastes are generally managed within the region where they arise. Table 3 below identifies the remaining landfill capacity in the region, based on the most recent (2019) Environment Agency data (Environment Agency, 2020).

3.1.2 Table 4 identifies remaining landfill capacity in North Lincolnshire. Although it is expected that the majority of waste from the Proposed Development will be diverted from landfill in accordance with the waste hierarchy, permitted landfill disposal capacity is a finite resource and hence the Institute for Environmental Management and Assessment (IEMA) "Guide to Materials and Waste in Environmental Impact Assessment" (IEMA, 2020) recommends assessing impacts of non-hazardous and inert waste with reference to the available landfill capacity in the region.

**Table 3: Landfill Capacity (2019), Yorkshire & Former Humberside (000 tonnes)**

Landfill Type	Sub-Region				Total (000 tonnes)
	Former Humberside	North Yorkshire	South Yorkshire	West Yorkshire	
Hazardous Merchant	835	-	-	1,815	2,650
Hazardous Restricted	-	-	-	-	-
Non Hazardous with stable non-reactive hazardous waste (SNRHW cell*)	1,243	-	-	-	1,243
Non Hazardous	21,614	2,761	1,715	1,252	27,342
Non Hazardous Restricted	1,642	14,340	-	-	15,982
Inert	15,340	1,258	5,744	3,131	25,473
<b>Total</b>	<b>40,674</b>	<b>18,359</b>	<b>7,459</b>	<b>6,198</b>	<b>72,690</b>

Source: <https://data.gov.uk/dataset/d409b2ba-796c-4436-82c7-eb1831a9ef25/2019-waste-data-interrogator>

**Table 4: Remaining Landfill Capacity, North Lincolnshire**

Site Name	Location	Type	Remaining Capacity, end 2019 (m <sup>3</sup> )
Kirton Lindsey Landfill Site	North Lincolnshire	L05 - Inert Landfill	12,750,000
Campwood Landfill Site	North Lincolnshire	L04 - Non Hazardous	3,706,353
Conesby Quarry Phase III	North Lincolnshire	L04 - Non Hazardous	3,750,000
South Ferriby Works Landfill	North Lincolnshire	L04 - Non Hazardous	14,000
Winterton South Landfill	North Lincolnshire	L01 - Hazardous Merchant Landfill	834,596
Roxby Landfill Site	North Lincolnshire	L04 - Non Hazardous	3,619,867
Crosby North Landfill	North Lincolnshire	L04 - Non Hazardous	1,641,736
Yarborough Quarry	North Lincolnshire	L04 - Non Hazardous	5,224,655
Winterton North Landfill	North Lincolnshire	L04 - Non Hazardous	2,509,476

Source: <https://data.gov.uk/dataset/237825cb-dc10-4c53-8446-1bcd35614c12/remaining-landfill-capacity>

3.1.3 The data shows that there is over 70 million cubic metres of landfill void space in the region, of which around 34 million cubic metres is in North Lincolnshire.

### 3.2 National Hazardous Waste Management Facilities

3.2.1 Due to the specialised nature of hazardous waste management, hazardous waste facilities typically receive wastes from a wide region, and therefore this Technical Note considers the national capacity for managing hazardous wastes.

3.2.2 Liquid hazardous waste from the operation of the Proposed Development may be managed by high-temperature incineration or by physical-chemical treatment. Sludge may be managed by these methods, or potentially may be landfilled. Alternatively, in the longer term, some form of waste treatment may be developed on or near to Proposed Development Site to manage waste generated in the CCP and other carbon capture facilities in the area, should other developments seek to undertake carbon capture, as planned for the Humber CCUS Cluster. However, in the absence of such facilities, this technical

note conservatively does not consider the potential for such waste treatment facilities to be developed.

- 3.2.3 As described in **Chapter 4: The Proposed Development (APP-047)** the Proposed Development is a ‘first of a kind’ for this type of power station infrastructure project and would represent one of the UK’s first power stations with carbon capture and storage (CCS) technology. As CCP/CCS technology has yet to be implemented at scale in the UK, there are no facilities that currently accept waste streams from CCS as there are no arisings in the UK. Consequently, the specific management route for CCP wastes will be determined in consultation with potential waste vendors following appointment of a contractor.
- 3.2.4 The Environment Agency Waste Data Interrogator reported that the remaining merchant (non-restricted) hazardous landfill capacity in England was 18.4 million cubic metres.
- 3.2.5 There are a number of high-temperature hazardous waste incinerators in England (excluding facilities which manage only clinical waste), as well as cement kilns which are permitted to accept hazardous waste. These facilities as reported in the Environment Agency Waste Data Interrogator for 2019 are shown in Table 5.

**Table 5: Hazardous Waste Incineration Facilities**

<b>Facility</b>	<b>Location</b>	<b>2019 throughput (tonnes of hazardous waste)</b>
<b>Hazardous Waste Incinerators</b>		
Avonmouth Treatment Centre	Bristol	4,267
East Kent Waste Recovery Facility	Kent	4,907
Ellesmere Port Incinerator	Cheshire	63,021
Fawley HT Incinerator	Hampshire	33,124
Fine Environmental Services - Seal Sands	Tees Valley	19,933
<b>Cement Kilns accepting Hazardous Waste</b>		
Cauldon Cement Plant	Staffordshire	12,020
Hope Cement Works	Derbyshire	77
Ketton Works	Rutland	18,408
Ribblesdale Cement Works	Lancashire	24,336
Rugby Cement Plant	Warwickshire	15,209

Facility	Location	2019 throughput (tonnes of hazardous waste)
South Ferriby Cement Plant	North Lincolnshire	33,733
Tunstead Cement and Lime Works	Derbyshire	12,531
Whitwell Quarry Lime works	Derbyshire	29,876
<b>Grand Total</b>		<b>271,442</b>

3.2.6 The Environment Agency Waste Data Interrogator for 2019 shows the following quantities of liquid hazardous waste were treated by permitted facilities in England (excluding waste in European Waste Code (EWC) Chapter 13 “Oil Wastes and Wastes of Liquid Fuels”).

**Table 6: Hazardous Liquid Waste Treatment Facilities in England**

Facility Permit Type	Tonnes received (2019)
T05 : Physico-chemical treatment installation	253,836
T06 : Chemical Treatment installation	223,041
T10 : Haz waste treatment installation	93,049
T11 : Haz waste transfer/treatment installation	43,490
<b>Grand Total</b>	<b>613,415</b>

3.2.7 Within Yorkshire and Humberside, the following facilities have been identified (excluding smaller facilities receiving less than 1,000 tonnes of waste) using the same criteria as above.

**Table 7: Hazardous Liquid Waste Treatment Facilities in Yorkshire and Humberside**

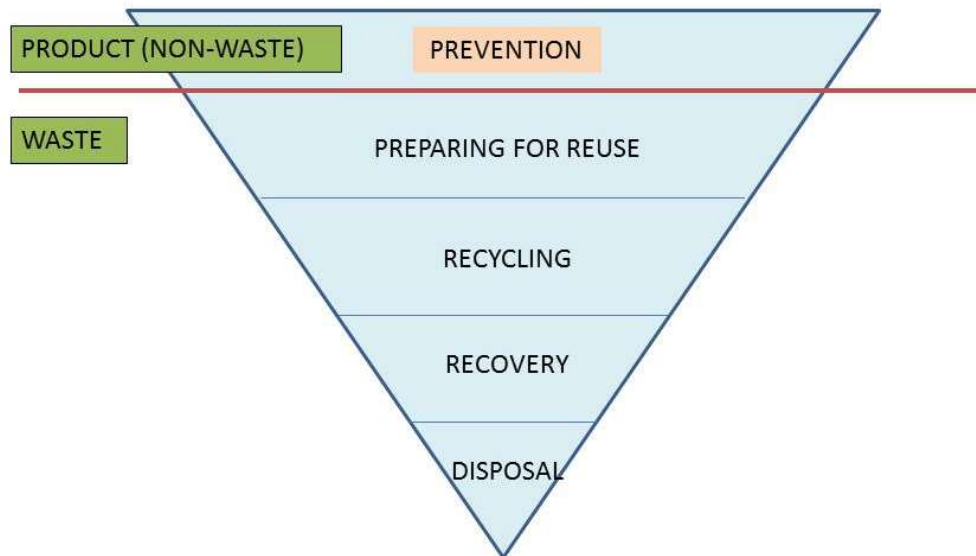
Facility	Tonnes received (2019)	Location
<b>T05 : Physico-chemical treatment installation</b>		
Ann Watson Street Site	4,191	Hull
Carr Crofts Waste Treatment Facility	6,909	Leeds
Knottingley Process Plant	1,446	Wakefield

<b>T06 : Chemical Treatment installation</b>		
Ecclesfield Industrial Waste Treatment Facility	9,328	Sheffield
Knothrop Waste Treatment Facility	54,009	Leeds
West Yorkshire Treatment Centre	4,744	Kirklees
<b>T10 : Haz waste treatment installation</b>		
Valley House	1,368	Leeds

## 4.0 IMPACTS OF WASTE FROM THE PROPOSED DEVELOPMENT

### 4.1 Construction and Demolition Wastes

4.1.1 The waste hierarchy prioritises waste minimisation, followed by reuse, then recovery (including recycling), with disposal as the least preferred option as shown in **Plate 1**.



**Plate 1 - Waste Hierarchy**

4.1.2 In line with the waste hierarchy, the intention will be to minimise the amount of waste generated by the Proposed Development across all development phases that requires disposal to landfill.

4.1.3 A Framework Site Waste Management Plan (SWMP) has been prepared as part of the Framework Construction Environmental Management Plan (CEMP) to accompany the Application (**APP-160**). This sets out the requirement for the completion of a construction stage SWMP and presents the approach that would be adopted as a minimum throughout construction phase in order to manage wastes in accordance with the waste hierarchy.

4.1.4 In practice, it is expected that the majority of construction and demolition wastes from the Proposed Development would be recycled or otherwise recovered. Government statistics report that the recovery rate for construction and demolition waste in England was 92.1% in 2016<sup>2</sup> (the most recent year for which data is published).

<sup>2</sup>

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data)

4.1.5 Even in the unlikely event that all of the construction waste from the Proposed Development was disposed of to landfill, this would only represent 0.19% of available regional landfill capacity, which is not considered to be a significant impact.

## 4.2 Operational Wastes

4.2.1 The IEMA “Guide to Materials and Waste in Environmental Impact Assessment” recommends assessing impacts of hazardous waste with reference to the available landfill capacity nationally.

4.2.2 Based on current design understanding, the only hazardous waste stream that may be suitable for landfill disposal is reclaimer sludge, with a volume of up to 8,000 m<sup>3</sup> per year (assuming a density of 1 tonne/m<sup>3</sup>). In the event that it is disposed of to landfill, the annual quantity is equivalent to 0.04% of remaining hazardous landfill void capacity in England and is not considered to be a significant impact. In the IEMA methodology, a reduction of <0.1% of national hazardous waste landfill void capacity by is considered to be of negligible magnitude.

4.2.3 Alternatively, if sludge from the CCP is disposed of by high-temperature incineration, and liquid effluents are managed by hazardous liquid waste facilities, the wastes from the Proposed Development would be equivalent to 2.9% of 2019 hazardous waste incineration throughput; and 9.1% of 2019 liquid waste treatment throughput (at the national level).

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[a/file/918270/UK\\_Statistics\\_on\\_Waste\\_statistical\\_notice\\_March\\_2020\\_accessible\\_FINAL\\_updated\\_size\\_12.pdf](#)



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## 5.0 OTHER ENVIRONMENTAL EFFECTS

### 5.1 Overview

- 5.1.1 This Technical Note includes an assessment of the ancillary or indirect effects associated with the estimated sources and volumes of waste arisings considering the potential for increases in noise and other pollutants where these are not already covered in technical chapters of the Environmental Statement.
- 5.1.2 The combined effects during construction and during operational phases of the handling of materials including the wastes set out in this Technical Note have been considered in **Chapter 19: Cumulative and Combined Effects (APP-062)**.
- 5.1.3 In summary, **Chapter 10: Traffic and Transport (APP-053)** considers a range of different traffic-related effects on roadside receptors, including severance, pedestrian amenity, fear and intimidation, highway safety and driver delay. The traffic forecasts which form the basis of the assessment presented in **Chapter 10: Traffic and Transport** include HGV's related to movement of wastes off-site and these movements do not coincide with the peak of construction which occurs later in the construction programme. Therefore, the movement of wastes set out in this technical note does not change the worst-case assessment of traffic effects presented in the Environmental Statement.
- 5.1.4 There is potential for receptors located close to the road network to experience combined effects from traffic (severance, pedestrian amenity, highway safety etc.), noise, vibration and air emissions during construction of the Proposed Development, including as a consequence of movements of construction waste. However, given the controls on construction traffic that will be implemented through the Construction Traffic Management Plan (CTMP) (a Framework CTMP is provided as **APP-161**), including waste HGV arriving/ departing the Proposed Development Site on the A18 from the west, the construction traffic assessment does not identify any significant effects on roadside receptors, (severance, pedestrian amenity, fear and intimidation or highway safety). As the air quality and noise assessments also do not identify any significant effects on sensitive receptors located close to the road network, it follows that combined effects on roadside properties due to road traffic arising from waste management activities and related air/ noise emissions are not anticipated to be significant.
- 5.1.5 The effects of road traffic emissions from activities including waste management on air quality during the operational phase are screened out based on published DMRB and IAQM thresholds in **Chapter 8: Air Quality (APP-051)**. As a result, there is no potential for significant combined air quality effects due to road traffic emissions on receptors.
- 5.1.6 Operational road traffic noise effects were also scoped out of further assessment (refer to **Chapter 9: Noise and Vibration – APP-052**) and is therefore not applicable to the combined effects assessment.

## 6.0 CONCLUSION

### 6.1 Overview

- 6.1.1 Taking into consideration reasonable worst-case estimates for the types and quantities of waste associated with construction, operation and decommissioning of the Proposed Development set out in Section 2, and application of the waste hierarchy to manage waste arisings described in Section 4, the severity of impact to waste management infrastructure identified in Section 3 is not anticipated to be significant.
- 6.1.2 No significant indirect effects have been identified in relation to waste management as described in Section 5. Therefore, there are no changes to the significance of effects presented in the ES (**APP-042 – APP-098**).

## 7.0 REFERENCES

Institute for Environmental Management and Assessment (2020) – *Guide to Materials and Waste in Environmental Impact Assessment*.

Environment Agency (2020) *2019 Waste Data Interrogator*. Available online [2019 Waste Data Interrogator - data.gov.uk](https://data.gov.uk)

