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 Statement
Volume II - Appendix 9B: Operational Noise Information

The Planning Act 2008

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

Applicant: Keadby Generation Limited

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GLOSSARY

Abbreviation	Description
AGI	Above Ground Installation
CCGT	Combined Cycle Gas Turbine
CCP	Carbon Capture Plant
DCC	Direct Contact Cooler
DCO	Development Consent Order
ES	Environmental Statement
FEED	Front End Engineering Design
HRSG	Heat Recovery Steam Generator
ISO	International Organization for Standardization
kV	Kilovolt
LIDAR	Light Detection and Ranging
OS	Ordnance Survey
PCC	Power and Carbon Capture
PEI	Preliminary Environmental Information

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TABLES

1.0 INTRODUCTION

1.1 Overview

1.1.1 AECOM Infrastructure and Environment Limited ('AECOM') has been commissioned by the Applicant to prepare a Development Consent Order (DCO) application for a proposed low carbon gas fired generating station on the Keady Power Station site at Keadby, Scunthorpe, DN17 3EF (hereafter referred to as the 'Proposed Development').

1.1.2 Section 2 of this appendix provides information on the approach and data used for the assessment of operational noise within **Chapter 9**: Noise and Vibration of the Environmental Statement (ES) (ES Volume I – **Application Document Ref 6.2**).

1.1.3 The terms of reference used to describe the Proposed Development in this report are broadly consistent with those defined within the main chapters of the ES and illustrated on **Figure 3.3:** Areas of the Site Referred to in the ES (ES Volume III – **Application Document Ref. 6.4**).

1.1.4 The Proposed Development Site encompasses an area of approximately 69.4 hectares (ha) which includes circa 20.7ha of land for construction laydown.

1.1.5 The Proposed PCC Site comprises an area of approximately 18.7ha of the Proposed Development Site within the wider Keadby Power Station site that is located within Keadby Common. Overhead electricity transmission lines associated with the existing National Grid 400kV Substation bisect the Proposed PCC Site. Land to the south of these overhead lines within the Proposed PCC Site is proposed for administration/ control room/ warehouse buildings and car parking areas and an above ground installation (AGI) for the gas connection. The area of the Proposed PCC Site on which the power generation (Combined Cycle Gas Turbine (CCGT)), Carbon, Capture and Compression (CCP) and associated stacks will be developed is referred to as the 'Main Site' herein.

2.0 OPERATIONAL NOISE INFORMATION

2.1 Noise model Settings

2.1.1 The Proposed Development was constructed in CadnaA (version 2021) acoustic modelling software. This software implements the sound propagation calculation methodology set out in ISO 9613-2:1996: Attenuation of Sound during Propagation Outdoors.

Data Sources - Proposed Power Plant Site

Table 1: Modelling Input Data

Model element	Data package	Format	Source file	Received from	Received Data
Digital Terrain Map	Light Detection and Ranging (LIDAR)	.tiff	National-LIDAR-Programme-DTM-2018-SE81sw.zip National-LIDAR-Programme-DTM-2018-SE82sw.zip	Downloaded from Open Survey Data (www.environment.data.gov.uk/DefraDataDownload)	05 June 2020
Topography; Building Height Attribute; Ground Absorption	OS MasterMap Topography Layer	.shp	OSMM_2020.zip	Project Team	22 May 2020
Site building dimensions	Scheme designs	.pdf	Various files	Project Team	Updated throughout project
Sound source data	Keadby 2 Power Station ES, Karsto FEED study	.pdf	Various files	Project Team	Updated throughout project

Modelling Assumptions

2.1.2 The model was configurated with the following specifications:

- maximum number of reflections: 2;
- maximum source to receiver distance: 3km;
- areas of ground absorption were determined from the OS Topography Layer. Natural areas that are not water were assumed to be acoustically soft while all other areas were assumed to be acoustically hard;
- all buildings exhibited an absorption coefficient of 0.21;
- existing residential buildings have been assumed to be 4m for 1 storey, 6m for 2 storeys and plus 2.5m for every storey thereafter. The number of storeys for existing buildings was determined using a combination of OS MasterMap Topography Layer data and a survey of images from Google Earth 'Streetview';
- receivers were positioned at 1.5m from ground for 1 storey buildings, at 4m from ground for 2 storey buildings and then plus 2.5m for every storey thereafter;
- Proposed Development maximum building dimensions were provided by the Project Team, including those presented in **Chapter 4**: The Proposed Development (ES Volume I – **Application Document Ref. 6.2**);
- sound emission data for key sound emitting plant/ buildings within the CCGT component of Proposed Development (turbine halls, Heat Recovery Steam Generator (HRSG), peaking plant) has been sourced from the Keadby 2 Power Station ES (ERM, 2016 – 2018). Where sources are proposed to be internal, an external level has been calculated assuming walls are made of steel insulated panels. These levels have been adjusted such that when placed at the Keadby 2 Power Station plant location, they yield similar levels to those in the Keadby 2 Power Station ES;
- sound level data for the Carbon Capture Plant (CCP) has been sourced using available data from the Project Team. This includes the FEED study for a similar CCP at Karsto, Norway (Bechtel Overseas Corporation, 2019), data from Net Zero Teesside PEI Report (AECOM, 2020) or used the assumption that the CCP plant will produce 85 dB $L_{Aeq,T}$ at 1m for the CCP absorber stack exhaust, high pressure compressors and each of the inlet gas blowers;
- sound power levels for the absorber unit and Direct Contact Cooler (DCC) have been modelled based on the assumption of 85 dB $L_{Aeq,T}$ at 1m in free field conditions from the equipment enclosed in the building which has been assumed, as a worst-case, to be the same dimensions as the building. This sound source has then been assumed to be enclosed in a building of 100 mm thick concrete producing a reverberant internal level which has been used to calculate sound emission from the absorber;

- assumptions have been made in relation to areas in which there may be pumps (absorber unit auxiliaries; amine pumps; chemical storage pumps; compressor pumps; DCC auxiliaries; fire water tank pumps; steam condensate pumps). Each area has been assumed to contain 2 pumps that produce sound power levels of 85 dB $L_{Aeq,T}$ at 1m; and
- Proposed Development stack(s) have been modelled as individual point sources, located 0.1m above the top of each stack.

Table 2: Sound Power Levels

Source	Linear sound power levels each frequency band (dB)									Number in model	L_{WA} (dB)
	31	63	125	250	500	1k	2k	4k	8k		
CCGT Plant											
Hybrid cooling towers	116	111	114	109	96	88	93	93	89	1	104
Steam turbine hall	125	114	93	65	52	48	36	29	26	1	90
Steam turbine hall auxiliaries	108	99	78	50	37	33	21	15	12	1	78
Transformers	85	96	96	83	61	55	42	22	21	1	82
Power Control Centre (PCC)	87	83	70	48	26	3	1	-5	-6	1	59
Gas turbine hall	117	108	87	59	46	42	30	24	21	1	84
Gas gen turbine hall	95	98	84	62	33	29	22	11	8	1	73
Heat Recovery Steam Generator (HRSG)	134	124	99	78	66	58	50	40	47	1	100
Water Treatment	104	108	94	71	52	38	31	21	18	1	83

Source	Linear sound power levels each frequency band (dB)									Number in model	L_{WA} (dB)
	31	63	125	250	500	1k	2k	4k	8k		
Feedwater	116	119	105	82	63	49	42	32	29	1	95
Turbine intake	131	123	115	99	94	97	90	92	89	1	104
Water treatment container	93	97	99	89	81	75	75	67	60	1	87
CCP											
Inlet gas blower casing	94	93	93	98	91	83	83	72	65	3	93
Absorber stack exhaust	109	100	99	92	98	90	86	74	76	1	97
Absorber stack	115	106	105	98	104	96	92	80	82	1	103
Absorber*	97	88	85	81	83	66	53	35	37	1	81
Direct Contact Cooler*	91	82	79	75	78	61	48	30	32	1	76
Compressor	149	138	117	89	76	72	60	53	50	1	114
Pumps**	107	111	110	99	88	81	79	77	74	14	96

*These source sound power levels have been calculated by assuming 85 dB at 1m in free field conditions from the equipment enclosed in the building which has been assumed as a worst-case to be the same dimensions as the building. This has then been assumed to be enclosed in a building made of 100mm thick concrete

**two pumps for each of: Absorber auxiliaries; amine pumps; chemical storage pumps; compressor pumps; DCC auxiliaries; fire water tank pumps; steam condensate pumps

Uncertainty

2.1.3 It should be noted than any predictions of sound levels have an associated degree of uncertainty. Modelling and measurement processes have been carried out in such a way to reduce such uncertainty. In particular, the following sources of uncertainty have been noted:

- sound emission data for key sound emitting plant/ buildings within the Proposed Development have been based on data provided by the manufacturers for the Keadby 2 Power Station ES (CCGT) and data from the CCP at Karsto, Norway, Net Zero Teesside CCP or assumed 85dB $L_{Aeq,T}$ at 1m. These data are assumed to be representative of the Proposed Development, although the precise methodology by which these data were gathered by third parties, and hence the uncertainty associated with these, is not known; and
- predictions of sound pressure levels according to ISO 9613 are based on an assumption of moderate downwind propagation, and hence could be considered as a worst-case calculation. However, the standard also indicates an estimated accuracy of ±3 dB(A) in predicted levels.

3.0 REFERENCES

AECOM (2020) *Appendix 11B: Operational Noise Information*. Available online: https://www.netzeroteesside.co.uk/wp-content/uploads/2020/06/PEIR-Appendix-11B-Operational-Noise-Information.pdf

Bechtel Overseas Corporation (2019) *CO_2 Capture Facility at Karsto, Norway FEED Study report*

Environmental Resources Management (ERM) (2016) *Keadby 2 Power Station Environmental Statement*

Environmental Resources Management (ERM) (2018) *Keadby 2 Power Station Environmental Statement Update Report*