Notice of variation and consolidation with introductory note

The Environmental Permitting (England & Wales) Regulations 2016

Keadby Generation Limited

Keadby Power Station
Trentside
Keadby
Scunthorpe
DN17 3EF

Variation application number

EPR/YP3133LL/V013

Permit number

EPR/YP3133LL

Keadby Power Station
Permit number EPR/YP3133LL

Introductory note

This introductory note does not form a part of the notice.

Under the Environmental Permitting (England & Wales) Regulations 2016 (schedule 5, part 1, paragraph 19) a variation may comprise a consolidated permit reflecting the variations and a notice specifying the variations included in that consolidated permit.

Schedule 2 of the notice comprises a consolidated permit which reflects the variations being made. All the conditions of the permit have been varied and are subject to the right of appeal.

This is a substantial variation (V011) comprising of the addition of a new power plant, a post-combustion amine-based (Monoethanolamine, MEA) carbon capture plant (CCP) for permanent geological storage and their ancillary requirements. The new plant will be referred to as Keadby 3, see below for details.

This permit also includes variations V012 and V013.

Variation V012 proposes an increase to the emissions to water differential temperature limits to include and account for a 'one-pump scenario'.

Variation V013 incorporates differential temperature limits for normal operations from emission point W1 that have been proposed as a result of IC3 and includes 'cable pull pit water' to the existing Keadby 2 cooling tower basin which after pH correction is discharge to the River Trent, via emission point W10.

The rest of the installation is unchanged and continues to be operated as follows:

Keadby Site

Keadby Power Station is located at Keadby, Scunthorpe in North Lincolnshire. The entire installation covers an area of around 101,650 m^2 in an area 500m north west of the village of Keadby with the centre of the site at grid reference SE 828 116. The area is predominantly mixed residential and agricultural use. To the east lies the River Trent approximately 450m running in a south to north direction feeding into the Humber Estuary (a Site of Special Scientific Interest (SSSI) and listed European Site to the north-east). The distillate oil off loading jetty is located on Trentside Road which runs alongside the River Trent with a small school, wood yard and a number of residential properties located on the opposite side of Trentside Road. Further to the east lies Scunthorpe at approximately 3.5km. The nearest houses are 150m and 200m to the north (both single properties) with a number of further properties at 250m. Immediately to south lies Stainforth and Keadby Canal and beyond this to the north-east a housing estate at approximately 500m. To the west is undeveloped land, with reported historical use for coal stock and ash tipping. There are emissions to air and to water from the installation.

Keadby 1

The main operational processes at Keadby 1 consists of two General Electric 9FA 03 gas turbines (245MWe each) fitted with dry low NO_x burners. Each gas turbine exhausts through a heat recovery boiler with the combined steam output passing to the condensing steam turbine (nominal capacity of 260MW). The windshields for the 2 x Combined Cycle Gas Turbine (CCGT) stacks are 60m and the 2 x OCGT stacks are 47m. All electrical capacity is exported to the National Grid less the parasitic station load of nominally 12MW. Total thermal input for the gas turbines and steam turbine is approximately 1,339MW (LHV).

These gas turbines have the DEFRA LCP reference numbers LCP202 and LCP203.

A standalone auxiliary gas turbine of 25MW (75MW thermal input) operates in open cycle mode, with a windshield of 50m and provides additional supply to the grid during high demand periods and for main plant start up during 'black start' conditions. An auxiliary gas boiler of approximately 2MW provides steam for gland sealing and plant start up. This gas turbine has the DEFRA LCP reference number LCP204.

Variation V012 introduces a 'one-pump' scenario for a thermal plume discharge from Keadby 1 via emission point W1 when just one of the two pumps is in operation. This scenario is to account for planned maintenance of the pumps.

Keadby 2

The main operational processes at Keadby 2 consist of 1 x gas turbine unit with an output capacity of up to 610MWe, 1 x heat recovery steam generator of approximately 710MWth and 1 x steam turbine unit of approximately 300MWe. The total thermal input for the gas turbines and steam turbine is approximately 1430MWth. The gas turbine exhausts through a heat recovery boiler which has an integrated Selective Catalytic Reduction (SCR) abatement system, with the steam output passing to the condensing steam turbine. The main stack is 75m in height, with 2 x smaller stacks associated with the emergency diesel generator and Gas Heaters. A maximum of 910MWe (gross) electrical capacity is exported the National Grid less the parasitic load of nominally 17MW.

The gas turbine has the DEFRA LCP reference number LCP682.

Keadby 2 has an emergency diesel generator (rated 3MW), this generator is not subject to the requirements of the Medium Combustion Plant Directive (MCPD).

Variation V013 introduces 'cable pull pit water' to the existing Keadby 2 cooling tower basin which after pH correction is discharge to the River Trent, via emission point W10. All of the pollutants found in the 'cable pull pit water' are found to be 'insignificant' in the H1 emissions to surface water screening tests.

Keadby 3

Keadby 3 will generate electricity from combustion of natural gas within a CCGT, using hot gas from the combustion process to drive the gas turbine (GT), and steam generated from the heat of the hot gas, in the heat recovery steam generator (HRSG), which is used to drive the steam turbine (ST).

The total thermal input for the gas turbines and steam turbine is approximately 1,500MWth. The Keadby 3 CCGT will have an auxiliary electric boiler (boiler 1), to seal gland and allow a vacuum to be raised in the condenser, which has been rated at 3.8MW and an emergency diesel generator (A52) to provide backup power for safe shutdown in the event of a power failure.

GT1 & GT2 of Keadby 1 cannot synchronise to the grid at the same time as Keadby 3.

The HRSG will be let-down through the ST to maximise power generation and will also provide steam to the Carbon Capture Plant (CCP) for use as heat. Power generated from the GT and ST will be exported to National Grid's National Electricity Transmission System (NETS).

The exhaust gas from the HRSG is passed to the CCP for carbon dioxide (CO_2) abatement, passing first through pre-treatment stages. This includes control by primary means and the use of dry low NOx burners (operated and controlled through an automated process control system) and may include selective catalytic reduction (SCR) for control of oxides of nitrogen (NOx) located within the HRSG for optimal temperature, then quenching via a direct contact cooler (DCC) as the first processing stage of the CCP.

The plant will comprise of a main stack from the HRSG (A106) that is 85m in height (which will be used for abnormal operations when the CCP is not operating), with 2 x smaller stacks (A105a & A105b) associated with the CCP absorber stacks. The CCP will also utilise an electric auxiliary boiler (boiler 2) to provide heat/steam to the carbon capture plant during commissioning, start-up and shutdown. Maintaining the CCP in a 'hot' or 'warm' stand-by state when the CCGT is off-line, and an emergency diesel generator (A53) to provide backup power for safe shutdown in the event of a power failure.

The Keadby 3 section of the site will also utilise a diesel fire water pump (A54) to provide fire water in the event of a fire where the electric fire pump is not available.

The key sources of waste waters generated at Keadby 3 originate from:

- Clean surface water run-off from non-process areas
- Blow down from the hybrid cooling towers and HRSG
- Waste water (DCC) (from the wastewater treatment plant to remove ammonia, if necessary) reused in the cooling towers/HRSG prior to discharge with the blow down detailed above
- Demineralisation plant and condensate polishing plant regeneration; and
- Rejected wastewater stream from the raw water treatment plant

Cooling water

To reduce the abstracted water volume required for cooling, a water treatment plant will receive water from a raw water tank, which is made up of abstracted canal water, surface water drainage, treated DCC water, centrate water from the Dissolved Air Flotation (DAF) centrifuge, backwash from the UltraFiltration (UF) units, cooling tower blowdown, and other wastewaters on site suitable for reuse.

The water treatment plant will include DAF units (to remove suspended solids and algae from the abstracted canal water), UF units, Reverse Osmosis (RO) units and an electro-deionisation (EDI) plant.

The sludge from the DAF plant will be centrifuged to remove water, with the solids being collected for offsite treatment and disposal. The centrate water will be recycled back through the water treatment plant via the raw water tank.

The DCC wastewater will be reused in the process (e.g. cooling water makeup) via additional treatment (to remove ammonia (slip) from the use of SCR, if necessary), any excess treated DCC water will be discharged in combination with the water treatment plant water and cooling water directly to the River Trent via compliance point W12 to the existing Keadby 1 discharge point (W1).

The contaminants present in the abstracted cooling water (with the exception of ammonia) are associated with the 'concentration up' of existing contaminants present in the abstracted canal water.

Emissions to water and potential impacts

This combined effluent discharge including cooling water will be released via emission point W12, into the Keadby 1 cooling water culvert before final discharge to the River Trent via the existing outfall at release point W1. The discharge has been assessed for impact significance with all parameters found to be insignificant in either the H1 screening tests or modelling.

CO_2 compression and venting

The CO_2 undergoes staged compression (to approximately 30 barg), and then passes through conditioning plant, which will include oxygen removal using hydrogen gas and platinum catalyst and dehydration to remove water. This water will be recovered into the solvent loop. The de-oxygenation package will require LP steam to preheat the CO_2 product for the catalytic reduction reaction.

The onsite conditioning will remove oxygen and water from the CO_2 to meet the requirements of the Transport and Storage (T&S) network. The quality of the CO_2 will be monitored online for compliance with export specifications to ensure the required specification is met and fiscal flow metering will be provided for custody transfer of CO_2 sent to the T&S network.

It has been proposed that emergency venting of CO_2 will be from two separate vent lines attached to the stack of each absorber, however this design has not been finalised. A pre-operational condition (PO7) has been included in the permit which requires the submission of the final CO_2 venting design and to validate assumptions made in the CO_2 venting emissions to air assessment submitted.

A 910MWe (gross) electrical capacity is exported the National Grid less the parasitic load of nominally 51MWe.

The gas turbine has the DEFRA LCP reference number LCP689.

The following services will be shared with Keadby 1 and 2 power stations:

- Shared utilities and control room
- Common management systems
- Common operations maintenance, management and support services team
- Shared access point
- Common Water Treatment Plant (WTP) for boiler makeup water.

Keadby 3 will be a stand-alone plant with no shared services.

The schedules specify the changes made to the permit.

The status log of a permit sets out the permitting history, including any changes to the permit reference number.

Status log of the permit		
Description	**Date**	**Comments**
Application EPR/YP3133LL/A001	Duly made 03/04/2006	
Additional information received		13/10/2006, 27/10/2006
Permit determined EPR/YP3133LL	21/06/2007	
Variation determined EPR/YP3133LL/V002	21/01/2010	Variation to correct errors, incorporate benchmark emission limits and update improvement conditions table.
Variation determined EPR/YP3133LL/V003	04/02/2010	Variation to correct errors, incorporate benchmark emission limits and update improvement conditions table.
Variation determined EPR/YP3133LL/V004	11/03/2013	Environment Agency initiated variation, to incorporate Eel Regulations improvement condition.
Variation determined EPR/YP3133LL/V005	Issued 29/09/2014	Environment Agency Initiated Variation, to add an improvement condition requiring a cost benefit appraisal to ensure compliance with the Eels Regulations. Effective 1/10/2014.
Regulation 60 Notice sent to the Operator	31/10/2014	Issue of a Notice under Regulation 60(1) of the EPR. Environment Agency Initiated review and variation to vary the permit under IED to implement the special provisions for LCP under Chapter III, introducing new Emission Limit Values (ELVs) applicable to LCP, referred to in Article 30(2) and set out in Annex V. The permit is also updated to modern conditions.
Regulation 60 Notice response	23/03/2015	Response to Notice under Regulation 60(1) of the EPR received from the Operator.
Additional information received	10/07/2015	Response to request for further information (RFI) dated 26/06/2015.
Additional information received	05/11/2015	Response to request for further information (RFI) dated 05/11/2015 regarding water emission point and LCP204.
Additional information received	19/11/2015	Response to request for further information (RFI) dated 18/11/2015 requesting revised plan of emission points
Additional information received	27/11/2015	Response to the request for information (RFI) regarding MSUL/MSDL dated 18/11/2015.
Additional information received	21/12/2015	Confirmation of compliance route (TNP) for LCPs. Letter dated 18/12/2015.

Status log of the permit		
Description	**Date**	**Comments**
Variation determined EPRYP3133LL/V006	24/12/2015	Varied and consolidated permit issued in modern condition format. Variation effective from 01/01/2016.
Regulation 61 Notice sent to the Operator	05/01/2018	Issue of a Notice under Regulation 61(1) of the EPR. Environment Agency initiated review and variation to vary the permit under IED to implement Chapter II following the publication of the revised Best Available Techniques (BAT) Reference Document for large combustion plant.
Regulation 61 Notice response.	30/10/2018	Response received from the Operator.
Part surrender application EPR/YP3133LL/S007	Duly made 11/01/2019	Application to surrender an area of unused land from the installing boundary, and removal of surface water emission W4.
Part surrender determined EPR/YP3133LL	10/05/2019	Part surrender complete
Variation addition of dewatering discharge EPR/YP3133LL/V008	Duly made 13/09/2019	Addition of dewatering discharge
Variation determined EPR/YP3133L/V008	11/10/2019	Variation determined
Variation determined EPR/YP3133LL/V009	08/04/2020	LCP Environment Agency initiated review, varied and consolidated permit issued. Effective from 08/04/2020
Application for Variation EPR/YP3133LL/V010	Duly made 02/12/2019	To add Keadby 2 turbine and associated utilities.
Request for Further Information	Received 27/08/2020	Supplementary Information Annex C, Air Quality Assessment.
Variation determined	20/11/2020	
Application for Variation EPR/YP3133LL/V011	Duly made 20/06/2022	Variation to add CCGT (Keadby 3) and Post-combustion Carbon Capture Plant
Additional information received	09/05/2023 19/01/2024 30/01/2024 02/02/2024 12/03/2024 05/04/2024 11/10/2024	Responses to Schedule 5 Notice and further information/clarification requests 09/05/2023 S5NR 19/01/2024 S5Nv2R 30/01/2024 S5NR 02/02/2024 response to email dated 30/01/2024 12/03/2024 response to email dated 23/02/2024 05/04/2024 response to emails dated 22 & 25/03/2024 11/10/2024 comments from operator review
Application for Variation EPR/YP3133LL/V012	Duly made 30/01/2024	Variation to include emission to water limits for a ‘one pump scenario’ for cooling waters discharged from Keadby 1

Status log of the permit		
Description	**Date**	**Comments**
Application for Variation EPR/YP3133LL/V013	Duly made 30/01/2024	Variation to incorporates differential temperature limits for normal operations from emission point W1 that have been proposed as a result of IC3 and the re-routing of cable pull-pit effluent from emission point W11 to Keadby 2 cooling tower basin where after pH correction is discharged via W10 (and ultimately W1).
Variation determined EPR/YP3133LL/V013	21/10/2024	To make changes requested in variations V011, V012 and V013 and produce a consolidated permit.

Other Part A installation permits relating to this installation		
Operator	**Permit number**	**Date of issue**
National Grid	EPR/BP3438LD	20/12/2006

End of introductory note

Notice of variation and consolidation

The Environmental Permitting (England and Wales) Regulations 2016

The Environment Agency in exercise of its powers under regulation 20 of the Environmental Permitting (England and Wales) Regulations 2016 varies

Permit number

EPR/YP3133LL

Issued to

Keadby Generation Limited ("the operator")

whose registered office is

Keadby Power Station
Trentside
Keadby
Scunthorpe
DN17 3EF

company registration number 02729513

to operate a regulated facility at

Keadby Power Station
Trentside
Keadby
Scunthorpe
DN17 3EF

to the extent set out in the schedules.

The notice shall take effect from 21/10/2024

Name	Date
Anne Lloyd	**2**1/10/2024

Authorised on behalf of the Environment Agency

Schedule 1

All conditions have been varied by the consolidated permit as a result of an application from the operator.

Schedule 2 – consolidated permit

Consolidated permit issued as a separate document.

Permit

The Environmental Permitting (England and Wales) Regulations 2016

Permit number

EPR/YP3133LL

This is the consolidated permit referred to in the variation and consolidation notice for application EPR/YP3133LL/V011,V012 & V013 authorising,

Keadby Generation Limited ("the operator"),

whose registered office is

Keadby Power Station
Trentside
Keadby
Scunthorpe
DN17 3EF

company registration number 02729513

to operate a regulated facility at

Keadby Power Station
Trentside
Keadby
Scunthorpe
DN17 3EF

to the extent authorised by and subject to the conditions of this permit.

Name	Date
~~A~~**nne Lloyd**	**2**1/10/2024

Authorised on behalf of the Environment Agency

Conditions

1 Management

1.1 General management

1.1.1 The operator shall manage and operate the activities:

(a) in accordance with a written management system that identifies and minimises risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformances, closure and those drawn to the attention of the operator as a result of complaints; and

(b) using sufficient competent persons and resources.

1.1.2 Records demonstrating compliance with condition 1.1.1 shall be maintained.

1.1.3 Any person having duties that are or may be affected by the matters set out in this permit shall have convenient access to a copy of it kept at or near the place where those duties are carried out.

1.2 Energy efficiency

1.2.1 The operator shall:

(a) take appropriate measures to ensure that energy is used efficiently in the activities;

(b) take appropriate measures to ensure the efficiency of energy generation at the permitted installation is maximised;

(c) review and record at least every four years whether there are suitable opportunities to improve the energy efficiency of the activities; and

(d) take any further appropriate measures identified by a review.

1.2.2 The operator shall review the viability of Combined Heat and Power (CHP) implementation at least every 4 years, or in response to any of the following factors, whichever comes sooner:

(a) new plans for significant developments within 15 km of the installation;

(b) changes to the Local Plan;

(c) changes to the BEIS UK CHP Development Map or similar; and

(d) new financial or fiscal incentives for CHP.

The results shall be reported to the Agency within 2 months of each review, including where there has been no change to the original assessment in respect of the above factors.

1.3 Efficient use of raw materials

1.3.1 The operator shall:

(a) take appropriate measures to ensure that raw materials and water are used efficiently in the activities;

(b) maintain records of raw materials and water used in the activities;

(c) review and record at least every four years whether there are suitable alternative materials that could reduce environmental impact or opportunities to improve the efficiency of raw material and water use; and

(d) take any further appropriate measures identified by a review.

1.4 Avoidance, recovery and disposal of wastes produced by the activities

1.4.1 The operator shall take appropriate measures to ensure that:

(a) the waste hierarchy referred to in Article 4 of the Waste Framework Directive is applied to the generation of waste by the activities;

(b) any waste generated by the activities is treated in accordance with the waste hierarchy referred to in Article 4 of the Waste Framework Directive; and

(c) where disposal is necessary, this is undertaken in a manner which minimises its impact on the environment.

1.4.2 The operator shall review and record at least every four years whether changes to those measures should be made and take any further appropriate measures identified by a review.

2 Operations

2.1 Permitted activities

2.1.1 The operator is only authorised to carry out the activities specified in schedule 1 table S1.1 (the "activities").

2.2 The site

2.2.1 The activities shall not extend beyond the site, being the land shown edged in green on the site plan at schedule 7 to this permit, but excluding the land edged/hashed in red and blue that is excluded from the permitted area.

2.3 Operating techniques

2.3.1 The activities shall, subject to the conditions of this permit, be operated using the techniques and in the manner described in the documentation specified in schedule 1, table S1.2, unless otherwise agreed in writing by the Environment Agency.

2.3.2 For the following activities referenced in schedule 1, table S1.1: LCP202, LCP203, LCP204, LCP 682 and LCP689. The activities shall be operated in accordance with the "Electricity Supply Industry IED Compliance Protocol for Utility Boilers and Gas Turbines" dated November 2022 or any later version unless otherwise agreed in writing by the Environment Agency.

2.3.3 If notified by the Environment Agency that the activities are giving rise to pollution, the operator shall submit to the Environment Agency for approval within the period specified, a revision of any plan or other documentation ("plan") specified in schedule 1, table S1.2 or otherwise required under this permit which identifies and minimises the risks of pollution relevant to that plan, and shall implement the approved revised plan in place of the original from the date of approval, unless otherwise agreed in writing by the Environment Agency.

2.3.4 Any raw materials or fuels listed in schedule 2 table S2.1 shall conform to the specifications set out in that table.

2.3.5 For the following activities referenced in schedule 1, table S1.1: LCP204. Standby fuel gas oil may be used but for no more than 500 hours per year.

2.3.6 For the following activities referenced in schedule 1, table S1.1: LCP202, LCP203 and LCP204 operating in open cycle mode. The activities shall operate for less than 1,500 hours per year as a rolling average over a period of five years with a maximum of 2,250 hours operated in any one year in line with Section 4.0 of Version 5.1: The Protocol for IED Annex V 1500 Limited Hours Derogation July 2015 or any later version.

2.3.7 For the following activities referenced in schedule 1, table S1.1: LCP202, LCP203, LCP204, LCP682 and LCP689. The end of the start-up period and the start of the shut-down period shall conform to the specifications set out in Schedule 1, tables S1.2 and S1.5.

2.3.8 For the following activities referenced in schedule 1, table S1.1: LCP202, LCP203, LCP682 and LCP689. The effective Dry Low NOx threshold shall conform to the specifications set out in Schedule 1, tables S1.2 and S1.6.

2.3.9 The emission limit values from emission points A1, A2, A3, A101, A105a, A105b and A106 listed in table S3.1 of Schedule 3 following the issue of a Black Start Instruction by the National Grid shall be disregarded for the purposes of compliance whilst that instruction remains effective and in accordance with the report submitted in response to improvement condition IC9, IC12 & IC24.

2.3.10 For the following activities referenced in schedule 1, table S1.1: LCP682 and LCP689. The following conditions apply where there is a malfunction or breakdown of any abatement equipment:

Unless otherwise agreed in writing by the Environment Agency:

(i) if a return to normal operations is not achieved within 24 hours, the operator shall reduce or close down operations;

(ii) the cumulative duration of breakdown in any 12-month period shall not exceed 120 hours; and

(iii) the cumulative duration of malfunction in any 12-month period shall not exceed 120 hours.

2.3.11 The operator shall ensure that where waste produced by the activities is sent to a relevant waste operation, that operation is provided with the following information, prior to the receipt of the waste:

(a) the nature of the process producing the waste;

(b) the composition of the waste;

(c) the handling requirements of the waste;

(d) the hazardous property associated with the waste, if applicable; and

(e) the waste code of the waste.

2.3.12 The operator shall ensure that where waste produced by the activities is sent to a landfill site, it meets the waste acceptance criteria for that landfill.

2.4 Improvement programme

2.4.1 The operator shall complete the improvements specified in schedule 1 table S1.3 by the date specified in that table unless otherwise agreed in writing by the Environment Agency.

2.4.2 Except in the case of an improvement which consists only of a submission to the Environment Agency, the operator shall notify the Environment Agency within 14 days of completion of each improvement.

2.5 Pre-operational conditions

2.5.1 The activities shall not be brought into operation until the measures specified in schedule 1 table S1.4 have been completed.

3 Emissions and monitoring

3.1 Emissions to water, air or land

3.1.1 There shall be no point source emissions to water, air or land except from the sources and emission points listed in schedule 3 tables S3.1 and S3.2.

3.1.2 The limits given in schedule 3 shall not be exceeded.

3.1.3 The emission values from emission point A101, A105a, A105b and A106 listed in schedule 3 table S3.1, measured during periods of abatement equipment malfunction and breakdown shall be disregarded for the purposes of compliance with table S3.1 emission limit values.

3.1.4 Periodic monitoring shall be carried out at least once every 5 years for groundwater and 10 years for soil, unless such monitoring is based on a systematic appraisal of the risk of contamination.

3.2 Emissions of substances not controlled by emission limits

3.2.1 Emissions of substances not controlled by emission limits (excluding odour) shall not cause pollution. The operator shall not be taken to have breached this condition if appropriate measures, including, but not limited to, those specified in any approved emissions management plan, have been taken to prevent or where that is not practicable, to minimise, those emissions.

3.2.2 The operator shall:

(a) if notified by the Environment Agency that the activities are giving rise to pollution, submit to the Environment Agency for approval within the period specified, an emissions management plan which identifies and minimises the risks of pollution from emissions of substances not controlled by emission limits;

(b) implement the approved emissions management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.

3.2.3 All liquids in containers, whose emission to water or land could cause pollution, shall be provided with secondary containment, unless the operator has used other appropriate measures to prevent or where that is not practicable, to minimise, leakage and spillage from the primary container.

3.3 Odour

3.3.1 Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved odour management plan, to prevent or where that is not practicable to minimise the odour.

3.3.2 The operator shall:

(a) if notified by the Environment Agency that the activities are giving rise to pollution outside the site due to odour, submit to the Environment Agency for approval within the period specified, an odour management plan which identifies and minimises the risks of pollution from odour;

(b) implement the approved odour management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.

3.4 Noise and vibration

3.4.1 Emissions from the activities shall be free from noise and vibration at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved noise and vibration management plan to prevent or where that is not practicable to minimise the noise and vibration.

3.4.2 The operator shall:

(a) if notified by the Environment Agency that the activities are giving rise to pollution outside the site due to noise and vibration, submit to the Environment Agency for approval within the period specified, a noise and vibration management plan which identifies and minimises the risks of pollution from noise and vibration;

(b) implement the approved noise and vibration management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.

3.5 Monitoring

3.5.1 The operator shall, unless otherwise agreed in writing by the Environment Agency, undertake the monitoring specified in the following tables in schedule 3 to this permit:

(a) point source emissions specified in tables S3.1 and S3.2; and

(b) process monitoring specified in table S3.3.

3.5.2 The operator shall maintain records of all monitoring required by this permit including records of the taking and analysis of samples, instrument measurements (periodic and continuous), calibrations, examinations, tests and surveys and any assessment or evaluation made on the basis of such data.

3.5.3 Monitoring equipment, techniques, personnel and organisations employed for the emissions monitoring programme and the environmental or other monitoring specified in condition 3.5.1 shall have either MCERTS certification or MCERTS accreditation (as appropriate), where available, unless otherwise agreed in writing by the Environment Agency.

3.5.4 Permanent means of access shall be provided to enable sampling/monitoring to be carried out in relation to the emission points specified in schedule 3 tables S3.1 and S3.2 unless otherwise agreed in writing by the Environment Agency.

3.6 Monitoring for Large Combustion Plant

3.6.1 All monitoring required by this permit shall be carried out in accordance with the provisions of Annex V of the Industrial Emissions Directive and the Large Combustion Plant Best Available Techniques Conclusions.

3.6.2 If the monitoring results for more than 10 days a year are invalidated within the meaning set out in condition 3.6.7, the operator shall:

(a) within 28 days of becoming aware of this fact, review the causes of the invalidations and submit to the Environment Agency for approval, proposals for measures to improve the reliability of the continuous measurement systems, including a timetable for the implementation of those measures; and

(b) implement the approved proposals.

3.6.3 Continuous measurement systems on emission points from the LCP's shall be subject to quality control by means of parallel measurements with reference methods at least once every calendar year.

3.6.4 Unless otherwise agreed in writing by the Environment Agency in accordance with condition 3.6.5 below, the operator shall carry out the methods, including the reference measurement methods, to use and calibrate continuous measurement systems in accordance with the appropriate CEN standards.

3.6.5 If CEN standards are not available, ISO standards, national or international standards which will ensure the provision of data of an equivalent scientific quality shall be used, as agreed in writing with the Environment Agency.

3.6.6 Where required by a condition of this permit to check the measurement equipment, the operator shall submit a report to the Environment Agency in writing, within 28 days of the completion of the check.

3.6.7 Where Continuous Emission Monitors are installed to comply with the monitoring requirements in schedule 3, table S3.1; the Continuous Emission Monitors shall be used such that:

(a) for the continuous measurement systems fitted to the LCP release points defined in table S3.1 the validated hourly, monthly, yearly and daily averages shall be determined from the measured valid hourly average values after having subtracted the value of the 95% confidence interval;

(b) the 95% confidence interval for nitrogen oxides and sulphur dioxide of a single measured result shall be taken to be 20%;

(c) the 95% confidence interval for dust releases of a single measured result shall be taken to be 30%;

(d) the 95% confidence interval for carbon monoxide releases of a single measured result shall be taken to be 10%;

(e) the 95% confidence interval for ammonia of a single measured result shall be taken to be 40%;

(f) an invalid hourly average means an hourly average period invalidated due to malfunction of, or maintenance work being carried out on, the continuous measurement system;

(g) any day, in which more than three hourly average values are invalid shall be invalidated;

(h) to allow some discretion for zero and span gas checking, or cleaning (by flushing), an hourly average period will count as valid as long as data has been accumulated for at least:
(i) 20 minutes of the period for open cycle turbines and engines; and

(ii) 40 minutes of the period for all other combustion appliances.

Such discretionary periods are not to exceed more than 5 in any one 24-hour period unless agreed in writing. Where plant may be operating for less than the 24-hour period, such discretionary periods are not to exceed more than one quarter of the overall valid hourly average periods unless agreed in writing.

4 Information

4.1 Records

4.1.1 All records required to be made by this permit shall:

(a) be legible;

(b) be made as soon as reasonably practicable;

(c) if amended, be amended in such a way that the original and any subsequent amendments remain legible, or are capable of retrieval; and

(d) be retained, unless otherwise agreed in writing by the Environment Agency, for at least 6 years from the date when the records were made, or in the case of the following records until permit surrender:

(i) off-site environmental effects; and

(ii) matters which affect the condition of the land and groundwater.

4.1.2 The operator shall keep on site all records, plans and the management system required to be maintained by this permit, unless otherwise agreed in writing by the Environment Agency.

4.2 Reporting

4.2.1 The operator shall send all reports and notifications required by the permit to the Environment Agency using the contact details supplied in writing by the Environment Agency.

4.2.2 A report or reports on the performance of the activities over the previous year shall be submitted to the Environment Agency by 31 January (or other date agreed in writing by the Environment Agency) each year. The report(s) shall include as a minimum:

(a) a review of the results of the monitoring and assessment carried out in accordance with the permit including an interpretive review of that data;

(b) the resource efficiency metrics set out in schedule 4 table S4.2;

(c) the performance parameters set out in schedule 4 table S4.3 using the forms specified in table S4.4 of that schedule;

(d) where conditions 2.3.5 and 2.3.6 apply, the hours of operation in any year;

(e) where condition 2.3.6 applies, the cumulative duration of breakdown and cumulative duration of malfunction in any 12 month period;

(f) where condition 2.3.6 applies, the rolling annual average hours of operation over a period of 5 years; and

(g) where condition 2.3.10 applies, the cumulative duration of breakdown and cumulative duration of malfunction in any 12 month period.

4.2.3 Within 28 days of the end of the reporting period the operator shall, unless otherwise agreed in writing by the Environment Agency, submit reports of the monitoring and assessment carried out in accordance with the conditions of this permit, as follows:

(a) in respect of the parameters and emission points specified in schedule 4 table S4.1;

(b) for the reporting periods specified in schedule 4 table S4.1 and using the forms specified in schedule 4 table S4.4; and

(c) giving the information from such results and assessments as may be required by the forms specified in those tables.

4.2.4 The operator shall, unless notice under this condition has been served within the preceding four years, submit to the Environment Agency, within six months of receipt of a written notice, a report assessing whether there are other appropriate measures that could be taken to prevent, or where that is not practicable, to minimise pollution.

4.2.5 Within 10 days of the notification of abatement equipment malfunction or breakdown (condition 2.3.10) the operator shall submit an Air Quality Risk Assessment as outlined in the IED Compliance Protocol (condition 2.3.2).

4.3 Notifications

4.3.1 In the event:

(a) that the operation of the activities gives rise to an incident or accident which significantly affects or may significantly affect the environment, the operator must immediately—

(i) inform the Environment Agency,

(ii) take the measures necessary to limit the environmental consequences of such an incident or accident, and

(iii) take the measures necessary to prevent further possible incidents or accidents;

(b) of a breach of any permit condition the operator must immediately—

(i) inform the Environment Agency, and

(ii) take the measures necessary to ensure that compliance is restored within the shortest possible time;

(c) of a breach of permit condition which poses an immediate danger to human health or threatens to cause an immediate significant adverse effect on the environment, the operator must immediately suspend the operation of the activities or the relevant part of it until compliance with the permit conditions has been restored.

(d) of any malfunction or breakdown of abatement equipment relating to condition 2.3.10, the operator shall notify the Environment Agency within 48 hours unless notification has already been made under (a) to (c) above.

4.3.2 Any information provided under condition 4.3.1 shall be confirmed by sending the information listed in schedule 5 to this permit within the time period specified in that schedule.

4.3.3 Where the Environment Agency has requested in writing that it shall be notified when the operator is to undertake monitoring and/or spot sampling, the operator shall inform the Environment Agency when the relevant monitoring and/or spot sampling is to take place. The operator shall provide this information to the Environment Agency at least 14 days before the date the monitoring is to be undertaken.

4.3.4 The Environment Agency shall be notified within 14 days of the occurrence of the following matters, except where such disclosure is prohibited by Stock Exchange rules:

Where the operator is a registered company:

(a) any change in the operator's trading name, registered name or registered office address; and

(b) any steps taken with a view to the operator going into administration, entering into a company voluntary arrangement or being wound up.

Where the operator is a corporate body other than a registered company:

(c) any change in the operator's name or address; and

(d) any steps taken with a view to the dissolution of the operator.

In any other case:

(e) the death of any of the named operators (where the operator consists of more than one named individual);

(f) any change in the operator's name(s) or address(es); and

(g) any steps taken with a view to the operator, or any one of them, going into bankruptcy, entering into a composition or arrangement with creditors, or, in the case of them being in a partnership, dissolving the partnership.

4.3.5 Where the operator proposes to make a change in the nature or functioning, or an extension of the activities, which may have consequences for the environment and the change is not otherwise the subject of an application for approval under the Regulations or this permit:

(a) the Environment Agency shall be notified at least 14 days before making the change; and

(b) the notification shall contain a description of the proposed change in operation.

4.3.6 The Environment Agency shall be given at least 14 days notice before implementation of any part of the site closure plan.

4.3.7 The operator shall inform the Environment Agency in writing of the closure of any LCP within 28 days of the date of closure.

4.4 Interpretation

4.4.1 In this permit the expressions listed in schedule 6 shall have the meaning given in that schedule.

4.4.2 In this permit references to reports and notifications mean written reports and notifications, except where reference is made to notification being made "immediately", in which case it may be provided by telephone.

Schedule 1 – Operations

Table S1.1 activities			
Activity reference	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity**	**Limits of specified activity**
AR1	Section 1.1 Part A(1)(a): Burning any fuel in an appliance with a rated thermal input of 50 megawatts or more.	**K1 (total thermal input for gas turbines and steam turbine is 1,339 MWth)–** LCP202 (combined cycle mode): The operation of a Combined Cycle Gas Turbine (CCGT) for the generation of electricity. LCP202 (open cycle mode): The operation of an Open Cycle Gas Turbine (OCGT) for the generation of electricity. LCP203: (combined cycle mode): The operation of a CCGT for the generation of electricity. LCP203 (open cycle mode): The operation of an OCGT for the generation of electricity. LCP204 (75 MWth input): The operation of an auxiliary OCGT for the generation of electricity and for black start operation. AB01: The operation of an auxiliary gas boiler with a net rated thermal input of 2MW for gland sealing and at main start up periods.	The operation of a gas fired power station comprising Keadby 1 from receipt of fuels as specified in Table S2.1 to discharge of exhaust gases and the generation of steam and electricity for export. GT1 & GT2 of Keadby 1 cannot synchronise to the grid at the same time as Keadby 3. From receipt, handling and on-site storage of raw materials and waste to despatch of products and waste but excluding operation of the odourisation plant.
		K2 (the total thermal input for the gas turbines and steam turbine is 1430 MWth) LCP682 The operation of a CCGT for the generation of electricity. Emergency back-up diesel generator 3MWth	The operation of a gas fired power station comprising Keadby 2 from receipt of fuels as specified in Table S2.1 to discharge of exhaust gases and the generation of steam and electricity for export. Including the operation of selective catalytic reduction abatement plant. From receipt, handling and on-site storage of raw materials and waste to

Table S1.1 activities			
Activity reference	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity**	**Limits of specified activity**
			despatch of products and waste. For use in the event of power failure for K1 and K2.
		K3 LCP689 Operation of a CCGT for the generation of electricity (thermal input 1500MWth). 2 x emergency back-up diesel generator to the CCGT units. 3MWth each. A diesel fuelled fire pump (3MWth) to be used in the event of a fire. The operation of an auxiliary electric boiler 1 with a net rated thermal input of 3.8MWth to provide steam to the CCGT for gland sealing, to allow a vacuum to be raised in the condenser and at main start up periods.	The operation of a gas fired power station comprising Keadby 3 from receipt of fuels as specified in Table S2.1 to discharge of exhaust gases and the generation of steam and electricity for export. GT1 & GT2 of Keadby 1 cannot synchronise to the grid at the same time as Keadby 3. Including the operation of selective catalytic reduction abatement plant (if necessary). From receipt of natural gas to the discharge of exhaust gases and wastes, and the generation and export of electricity. From receipt of raw materials to handling, on-site storage and handling for use in the CCGT and fire pump engine. During periods of abnormal operation, when the CCP is not operating, release to atmosphere of untreated exhaust gases from emission point A106.
AR2	Section 6.10 Part A(1)(a): Capture of carbon dioxide streams from an installation for the purposes of geological storage	Operation of a Carbon Capture Plant serving LCP689, involving the treatment of exhaust gas from the Heat Recovery Steam Generator (HRSG) into the capture plant using amine-based solvent to extract CO_2 followed by compression and dehydration of the CO_2 for off-site transportation and long-term geological storage, and release of	From receipt of exhaust gases from the HRSG in the capture plant to the reclaiming/regeneration of Monoethanolamine (MEA) solvent for re-use (by thermal reclaiming using steam distillation), and

Table S1.1 activities			
Activity reference	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity**	**Limits of specified activity**
		CO_2-abated flue gas to atmosphere at emission points A105a and A105b. The operation of an auxiliary electric boiler (3.8MWth) to provide heat/steam to the carbon capture plant during commissioning, start-up and shut-down to maintain the CCP in a 'hot' or 'warm' stand-by state when the CCGT is off-line. This will improve the carbon capture on start-up.	treatment of exhaust gas prior to export of CO_2 from the installation; release to atmosphere of treated exhaust gases from emission points A105a & A105b; and venting of CO_2 from emission points A107a and A107b adjacent to the absorber, emission points locations to be confirmed in response to PO7. From receipt of raw materials to on-site storage and handling for use in the Carbon Capture Plant.
Directly Associated Activities			
AR3	Directly associated activity	Oil storage	From receipt of raw materials to handling, on-site storage and handling for use.
AR4	Directly associated activity	Surface water drainage	Handling and storage of site drainage until discharge to the site surface water system. Including surface water storage in attenuation pond.
AR5	Directly associated activity	Water treatment	From receipt of raw materials to dispatch of treated effluent, process waters and dirty water system to final discharge.
AR6	Directly associated activity	Gas heaters	The operation of gas heating plants from receipt of raw materials to handling, onsite storage and handling for use.
AR7	Trade and/or non-sewage effluent discharge to surface water or groundwater requiring specific substances assessment (any volume)	Discharge of excavation dewaterings	Discharge of excavation dewaterings from redevelopment work via current discharge point W1 and within the current permitted volume.
AR8	Directly associated activity	Once through cooling system – Direct cooling water system used to cool	From intake of water into the system from the River

Table S1.1 activities			
Activity reference	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity**	**Limits of specified activity**
		exhaust steam and components of the generating plant.	Trent to final discharge into the River Trent. (This plant will be utilised by Keadby 1 only).
AR9	Directly associated activity	Hybrid cooling system – Indirect cooling water system used to cool exhaust steam and components of the generating plant.	From intake of water into the system from the Stainforth and Keadby canal, to final discharge into the River Trent. (This plant will be utilised by Keadby 2 and Keadby 3 only)
AR10	Directly associated activity	Operation of a Wastewater Treatment Plant	From receipt of raw materials to dispatch of treated effluent, process waters generated by the DCC and HRSG to final discharge via emission point W12 and ultimately W1.

Table S1.2 Operating techniques		
Description	**Parts**	**Date Received**
Application	The response to section 2.1, 2.2 and 2.3 excluding 2.3.4 and 2.3.5 in the Application.	03/04/2006
Receipt of additional information to the application	Responses to question 2 detailing air vent locations, pipe-work protection, specific site surface conditions, distillates transfer area improvements and BAT justification for distillate firing.	22/08/2006
Receipt of additional information to the application	BAT justification for firing with distillate oil.	16/10/2006, 26/10/2007
Response to improvement condition 3	Method for determining particulate matter and sulphur dioxide from emission points A1, A2 and A3.	September 2007
Response to improvement condition 6	Response to IC 6 detailing review of emissions from release point W1.	24/02/2009
Revised drawing Fig 2.22-1A emission points drawing (amendment v1)	Revised drawing to update emission points from site to include release point W4	30/10/2015
Response to regulation 60(1) Notice – request for information dated 31/10/14.	Compliance routes and operating techniques identified in response to questions 2 (selected compliance route), 4 (configuration of LCP), 10 (derogation to not undertake monitoring when on standby fuels), 11 (monitoring requirements). Excluding compliance route ELV for LCP202, LCP203 and LCP204 and related operating techniques.	Received 23/03/2015

Table S1.2 Operating techniques		
Description	**Parts**	**Date Received**
Receipt of additional information to the regulation 60(1) Notice. Requested by email dated 18/11/2015.	Operating techniques identified in response to questions 6 (minimum start up load and minimum shut down load) Excluding compliance route ELV for LCP202, LCP203 and LCP204 and related operating techniques.	Received 27/11/2015
Receipt of additional information to the regulation 60(1) Notice.	Confirmation of the compliance routes chosen for LCP202, LCP203 and LCP204.	Received 21/12/2015 (letter dated 18/12/2015)
Response to regulation 61(1) Notice – request for information dated 01/05/18 EPR/YP3133LL/V007	Compliance and operating techniques identified in response to the BAT Conclusions for large combustion plant published on 17th August 2017.	30/10/2018
Additional information in response to regulation 61(1) Notice EPR/YP3133LL/V007	Stated use of Distillate Fuel Oil in LCP 202,203 and 204 and also the stated hours of operation of the above	05/09/2019
Receipt of dewatering from excavation work for Keadby II to discharge via W1	Application form C2, C3 and C6 Environmental Permit Variation Application and water discharge – Supporting Information dated 03/06/2019.	13/09/2019
Response to regulation 61(1) Notice – request for information dated 01/05/18 EPR/YP3133LL/V009	Compliance and operating techniques identified in response to the BAT Conclusions for large combustion plant published on 17th August 2017. – Amended Operating hours and fuels to be used on site.	18/09/2019
Request for confirmation by email 16/01/20	The Operator has confirmed they will comply with Joint Environmental Programme (JEP) report – 'Characterisation of power plant fuels for compliance with LCP BREF Conclusion BAT 9' issued October 2019.	16/01/2020
Application for substantial variation EPR/YP3133LL/V010	Application form C2, C3 and Keadby 2 Power Station Environmental Permit Application: Supporting Information dated 20/11/2019	02/12/2019
Request for further Information	Supplementary Information Annex C, air Quality Assessment.	27/08/2020
Request for further Information	Amended drawings – Site layout air, Water emissions A03 and Annex A Drainage drawings edited 20200929	30/09/2020
Supplementary Information	Amended site plan	05/11/2020
Application for substantial variation EPR/YP3133LL/V011	Application form C2, C3 and Keadby 3 Low Carbon CCGT Generating Station Project Environmental Permit Application: Main Supporting Document dated July 2021 (Document Ref: 60625943-ACM-PM-RP-EN-001-A)	29/07/2021

Table S1.2 Operating techniques		
Description	**Parts**	**Date Received**
Schedule 5 Notice Request dated 07/03/2023	Environmental Permit Application Schedule 5 Response (dated 9th May 2023)	09/05/2023
Schedule 5 Notice Request dated 07/03/2023	Keadby 3 Environmental Permit Application Schedule 5 Second Issue Response (dated 19th January 2024) Appendix A – Revised Sankey Diagram (includes Carbon Capture Plant) Appendix B – CO2 Dispersion Assessment (Addendum for Absorber Venting) – Modelling Report Appendix E – Revised emissions to water risk assessment and modelling report Appendix F – Simplified Cooling Water Flow Diagram (Full Site)	19/01/2024
Request for further information	Appendix D – Revised Noise Modelling Report and associated Raw Data	02/02/2024
Request for further information	Update to the water flow diagram for the entire site Appendix E – Canal Water Lab Analysis Raw Data	22/03/2024
Request for further information/clarification	Response to clarification queries from emissions to water risk assessment report	05/04/2024
Comments from operator review	Comments and permit amendment requests with justification document, ref: Operator Review Comments and Resolutions	11/10/2024

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
IC1	The Operator shall continue to monitor emissions discharged from W2, W3 and W5 for the parameters given in the response to IC 8 on a quarterly basis for four further occasions. A written review of the monitoring analysis results shall be provided. Where substances do not comply with benchmark limits a written plan shall be submitted to the Agency detailing proposals for ongoing monitoring and the procedures and methods to be used in line with section 2.2.6 of 'IPPC Sector Guidance Note Combustion Activities' to ensure benchmark limits can be achieved. The plan shall be implemented by the operator from the date of approval by the Agency	Complete
IC2	The Operator shall review potential sources and emissions of suspended solids from emission point W1. A report summarizing the review shall be submitted for Agency approval. The report shall include all potential additional sources of suspended solids from the site process and drainage areas, any existing or proposed measures including a timetable for implementation of any new measures required to control suspended solids and any proposed emission limits.	Complete

IC3	The Operator shall review cooling water discharge temperature at the final point of discharge to the River Trent. A report summarizing the review and including a proposed temperature limit will be submitted for agreement. The report shall include justification that the proposed temperature limit represents BAT for the station and does not risk environmental harm.	Complete
IC4	The Operator shall undertake a review of the existing screening measures at the intakes and outfalls which provide and discharge water to and from the Installation. The review shall be undertaken with reference to the Eels (England and Wales) Regulations 2009 (SI 2009/3344) and the Environment Agency „"Safe Passage of Eel"" Regulatory Position Statement version 1 dated July 2012. The Operator shall submit details of the arrangement suitable to meet the requirements for the safe passage of eels [of the Eels (England and Wales) Regulations 2009 (SI 2009/3344)] by either:- • Providing a written proposal for the installation of an eel screen. • Providing a written proposal to the modification of existing screening arrangements. • Providing a written response with an explanation and description of how the existing screening arrangements can be regarded to meet the requirements for the safe passage of eels [of SI 2009/3344] either without change or with mitigation measures. • Providing a written response setting out a case for an exemption In all cases, the proposal shall be submitted in writing for the approval of the Environment Agency. Where appropriate, each proposal shall contain an assessment of alternative options considered including impacts on other fish species and an explanation of why the proposed option has been chosen. Where installation of eel screen; modification of existing arrangements; or mitigation measures are proposed, the submission shall contain relevant timescales for installation in accordance with the Safe Passage of Eel Regulatory Position Statement version 1 dated July 2012. The proposals shall be implemented in accordance with the Environment Agency's written approval.	Complete
IC5	The Operator has undertaken a review of the existing screening arrangements with reference to the Eels (England and Wales) Regulations 2009 (SI 2009/3344) and the Environment Agency ''Safe Passage for Eel'' Regulatory Position Statement version 1 dated July 2012 (and as amended February 2013) in response to Improvement Programme reference IP4. The Environment Agency has determined that the site does not comply with the requirements for safe passage of eel and the Operator is now required to complete a cost benefits appraisal of best available technique with reference to the Environment Agency ''Safe Passage for Eel: Guidance on Exemptions'' as a screening tool. a) If the Cost Benefit Assessment shows that the Benefits are greater than the costs by a factor of 1.5 or more, then the Operator shall submit to the Environment Agency for review a report setting out the costs and the technical and economic feasibility to introduce the improvements to achieve best available technique. b) If the Cost Benefit Assessment shows that the Benefits are not greater than the costs by a factor of 1.5 or more, then the Operator shall, with reference to the Environment Agency ''Safe Passage for Eel:	Complete

	Guidance on exemptions, assess which alternative measure, or combination of alternative measures, could be implemented under a case of a conditioned Exemption. The Operator shall submit a report to the Environment Agency setting out the costs and the technical and economic feasibility of implementing their proposed alternative measure or measures. In all cases, the submission shall contain relevant timescales in accordance with the Safe Passage for Eel Regulatory Position Statement version 1 dated July 2012 (as amended 2013). The proposals shall be implemented following written approval of the Environment Agency. Whilst undertaking this Improvement Condition, the Operator shall be operating under exemption from the requirements to place eel screen diversion structures pursuant to Regulation 17(5)(a) of the Eels (England and Wales) Regulations 2009. The exemption will remain in place until the Environment Agency has provided written approval that the Improvement Condition has been deemed complete.	
IC6	For LCPD LCP413, LCP414 and LCP415 (now LCP202, LCP203 and LCP204 under IED). Annual emissions of dust, sulphur dioxide and oxides of nitrogen including energy usage for the year 01/01/2015 to 31/12/2015 shall be submitted to the Environment Agency using form AAE1 via the NERP Registry. If the LPCD LCP was a NERP plant the final quarter submissions shall be provided on the RTA 1 form to the NERP Registry.	Complete
IC7	The Operator shall provide a report in writing to the Environment Agency for acceptance which provides the net rated thermal input for LCP202, LCP203 and LCP204. The net rated thermal input is the 'as built' value unless the plant has been modified significantly resulting in an improvement of the plant efficiency or output that increases the rated thermal input (which typically requires a performance test to demonstrate that guaranteed improvements have been realised). Evidence to support this figure, in order of preference, shall be in the form of:- a) Performance test results* during contractual guarantee testing or at commissioning (quoting the specified standards or test codes), b) Performance test results after a significant modification (quoting the specified standards or test codes), c) Manufacturer's contractual guarantee value, d) Published reference data, e.g., Gas Turbine World Performance Specifications (published annually); e) Design data, e.g., nameplate rating of a boiler or design documentation for a burner system; f) Operational efficiency data as verified and used for heat accountancy purposes, g) Data provided as part of Due Diligence during acquisition, *Performance test results shall be used if these are available.	Complete

IC8	The Operator shall submit a report in writing to the Environment Agency for acceptance. The report shall define and provide a written justification of the “minimum start up load” and “minimum shut-down load”, for each unit within the LCP as required by the Implementing Decision 2012/249/EU in terms of: The output load (i.e. electricity, heat or power generated) (MW); and This output load as a percentage of the rated thermal output of the combustion plant (%). And / Or At least three criteria (operational parameters and / or discrete processes as detailed in the Annex) or equivalent operational parameters that suit the technical characteristics of the plant, which can be met at the end of start-up or start of shut-down as detailed in Article (9) 2012/249/EU.	Complete
IC9	LCP 202, LCP203 and LCP204 A written report shall be submitted to the Environment Agency for approval. The report shall contain an impact assessment demonstrating that there is no significant environmental risk associated with black start operations and propose a methodology for minimisation of environmental impact during such a period of operation and for reporting instances of black start operation. The plant can be operated as set out in condition 2.3.9 of the permit once the report has been approved by the Environment Agency. The methodology for operation and reporting set out in the report shall be implemented by the Operator from the date of approval by the Environment Agency.	Complete
IC10	The Operator shall submit a report in writing to the Environment Agency for acceptance. The report shall define and provide a written justification of the “minimum start up load” and “minimum shut-down load”, for each unit within the LCP682 as required by the Implementing Decision 2012/249/EU in terms of: The output load (i.e. electricity, heat or power generated) (MW); and This output load as a percentage of the rated thermal output of the combustion plant (%). And / Or At least three criteria (operational parameters and / or discrete processes as detailed in the Annex) or equivalent operational parameters that suit the technical characteristics of the plant, which can be met at the end of start-up or start of shut-down as detailed in Article (9) 2012/249/EU.	Complete
IC11	The Operator shall for LCP682 submit a report in writing to the Environment Agency for approval. The report shall define an output load or operational parameters and provide a written justification for when the dry low NOx operation is effective. The report shall also include the NOx profile through effective dry low NOx to 70% and then to full load.	Complete

IC12	LCP682 A written report shall be submitted to the Environment Agency for approval. The report shall contain an impact assessment demonstrating that there is no significant environmental risk associated with black start operations and propose a methodology for minimisation of environmental impact during such a period of operation and for reporting instances of black start operation. The plant can be operated as set out in condition 2.3.9 of the permit once the report has been approved by the Environment Agency. The methodology for operation and reporting set out in the report shall be implemented by the Operator from the date of approval by the Environment Agency.	Complete
IC13	The Operator shall submit a written report to the Environment Agency describing the performance and optimisation of the Selective Catalytic Reduction (SCR) system and combustion settings to minimise oxides of nitrogen (NOx) emissions within the emission limit values described in this permit with the minimisation of nitrous oxide emissions. The report shall include an assessment of the level of NOx and NO2 emissions that can be achieved under optimum operating conditions. The report shall also provide details of the optimisation (including dosing rates) for the control of acid gases and dioxins	Complete
IC14	The Operator shall submit a written report to the Environment Agency on the commissioning of the installation. The report shall summarise the environmental performance of the plant as installed against the design parameters set out in the Application. The report shall also include a review of the performance of the facility against the conditions of this permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions.	Complete
IC15	**MSUL and MSDL (LCP689)** The Operator shall submit a written report to the Environment Agency for assessment and written approval. The report shall define the "minimum start-up load" (MSUL) and "minimum shut-down load" (MSDL) for LCP689. The report shall include a written justification of the MSUL and MSDL for LCP689 as required by the Implementing Decision 2012/249/EU in terms of: i. the output load (i.e. electricity, heat or power generated) (MW); and ii. the output load as a percentage of the rated thermal output of the combustion plant (%). and / or iii. at least three criteria (operational parameters and / or discrete processes as detailed in the Annex) or equivalent operational parameters that suit the technical characteristics of the plant, which can be met at the end of start-up or start of shut-down as detailed in Article (9) 2012/249/EU.	Within 12 months of the date of the first fire of LCP689 or as otherwise agreed in writing with the Environment Agency

IC16	**Dry low NOx (LCP689)** The Operator shall submit a written report to the Environment Agency for assessment and written approval to define when dry low NOx operation is effective for LCP689. The report shall include: • an output load or operational parameters to justify when the dry low NO_x operation is effective. • the NO_x profile through effective dry low NO_x to 70% and then to full load.	Within 4 months of the completion of commissioning of LCP689
IC17	**Commissioning (Keadby 3)** The Operator shall submit a written report to the Environment Agency for assessment and written approval on the commissioning of Keadby 3. The report shall summarise the environmental performance of the installation as set out in the commissioning plan required by pre operational condition PO1 in table S1.4 of this permit. The report shall include: • a summary of the environmental performance of the plant as installed against the design parameters and risk assessments set out in the application and updated in response to the pre-operational conditions in this permit; • a review of the performance of the facility against the conditions of this permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions and confirm that the Environmental Management System (EMS) has been updated accordingly.	Within 3 months of the completion of commissioning.
IC18	**Intensive monitoring exercise 1 Report (Keadby 3)** The Operator shall submit a written report to the Environment Agency for assessment and written approval. The report must contain details of the outcome of the intensive period of monitoring carried out as a result of the plan agreed in pre-operational condition PO2. In particular it will include details of the emission concentrations of NO_x, CO, SO_2, SO_3, ammonia, acetaldehyde, formaldehyde, ketones, acetic acid, total amines (expressed as MEA), MEA, EA, MDEA, DEA, DMA, MOR, MMA, 2-(ethylamine) ethanol, total nitrosamines expressed as N-nitrosodimethylamine (NDMA) and speciated nitrosamines (as per table S3.1) and the consistency of these emission concentrations. The notification requirements of condition 2.4.2 will be deemed to have been complied with on submission of the report.	Within 6 months of the completion of commissioning.

IC19	**Intensive monitoring exercise 2 – Plan (Keadby 3)** Following the completion of IC18, submit a long term monitoring plan to the Environment Agency for assessment and written approval, for NO_x, CO, SO_2, SO_3, ammonia, acetaldehyde, formaldehyde, ketones, acetic acid, total amines (expressed as MEA), MEA, EA, MDEA, DEA, DMA, MOR, MMA, 2-(ethylamine) ethanol, total nitrosamines expressed as N-nitrosodimethylamine (NDMA) and speciated nitrosamines (as per table S3.1); to the Environment Agency for technical assessment and agreement. The plan must include a review of the level of emissions and their variability and propose a suitable monitoring regime. The plan must contain dates for implementation. The notification of conditions 2.4.2 will be deemed to have been complied with on submission of the plan. You must implement the plan as agreed, and from the date stipulated by the Environment Agency.	Within 3 months of the completion of IC18
IC20	**Intensive monitoring exercise 2 – Report (Keadby 3)** The Operator shall submit a written report to the Environment Agency for technical assessment and written approval. The report must contain an emissions to air risk assessment in line with our guidance which is based on sampled and monitored emissions data from emission points A105a and A105b in table S3.1. Parameters to be included are as follows (or otherwise agreed in writing with the Environment Agency). Oxides of Nitrogen (NO and NO_2 expressed as NO_2) Carbon Monoxide (CO) Sulphur Dioxide (SO_2) Sulphur Trioxide (SO_3) Ammonia Acetaldehyde Formaldehyde, ketones and acetic acid Total Amines (expressed as MEA) Monoethanolamine – MEA Ethylamine (EA) Methyl diethanolamine (MDEA) Diethanoamine (DEA) Dimethylamine (DMA) Morpholine (MOR) Monomethylamine (MMA) 2-(ethylamine) ethanol Total Nitrosamines (expressed as NDMA) N-nitrosodimethylamine (NDMA) N-nitrosomorpholine N-nitrosomethylethylamine N-nitrosodiethylamine N-nitrosodiisopropylamine N-nitrosodipropylamine N-nitrosodibutylamine N-nitrosodibenzylamine N-(2-hydroxyethyl)ethylenediamine N-nitrosomorpholine N-nitrosodiethanolamine (NDELA)	Within 15 months of the completion of IC19

	N-nitrosomethylethylamine N-nitrosopyrrolidine N-nitrosodibenzylamine Emissions monitoring data obtained during the first year of operation shall be used to compare the actual emissions with those assumed in the impact assessment submitted with the permit application. For those parameters not included in the original impact assessment, or those showing to be at concentrations higher than those assumed, in the impact assessment submitted in the application, an assessment shall be made of the impact to human health and habitats of each parameter using the 'Air emissions risk assessment for your environmental permit - GOV.UK (www.gov.uk)' guidance. Where Environmental Assessment Levels (EALs) for emitted substances are not available on the current published EAL list on gov.uk you can propose a new EAL. To derive a new EAL, you should follow our published guidance on air emissions risk assessments. The notification requirements of condition 2.4.2 will be deemed to have been complied with on submission of the report.	
IC21	**Monitoring location validation – A105a, A105b & A106 (Keadby 3)** During commissioning of Keadby 3, the Operator shall carry out tests to assess whether the air monitoring locations A105a, A105b & A106 meet the requirements of BS EN 15259 and supporting Method Implementation Document (MID). The Operator shall submit a written report to the Environment Agency for assessment and written approval on the assessment of air emissions monitoring locations during commissioning of the installation. The report shall include: • whether the air monitoring location(s) meet the requirements of BS EN 15259 and supporting Method Implementation Document (MID); • the results and conclusions of the assessment including where necessary proposals for improvements to meet the requirements; • where notified in writing by the Environment Agency that the requirements are not met, the Operator shall submit proposals or further proposals for rectifying this in accordance with the timescale in the notification. The proposals shall be implemented in accordance with the Environment Agency's written approval.	Before the installation is successfully commissioned.

IC22	**NOx and CO emissions - activity AR1 in table S1.1 (Keadby 3)** The Operator shall submit a written report to the Environment Agency for assessment and written approval on their proposed achievable emission limit values (ELVs) for NOx and CO. ELVs shall be expressed as a daily mean of validated hourly averages from minimum start-up load (MSUL) to baseload, supported by a summary of emissions data.	Within 6 months of the completion of commissioning
IC23	**Carbon capture efficiency (Keadby 3)** The Operator shall submit a written report to the Environment Agency for assessment and written approval detailing the carbon capture efficiency of the Carbon Capture Plant and CCGT under normal operating conditions (calculated using the methodology as approved in accordance with PO1 in table S1.4 of this permit) averaged over one year of operation as specified in table S3.3 of this permit. The report shall address how, if under normal operating conditions, the carbon capture efficiency is reported to be less than the design capture performance specification of 95%, the Operator shall carry out an analysis of the issues affecting the performance of the plant with respect to achievement of the 95% carbon capture rate and either; • propose remedial actions for approval by the Environment Agency designed to improve capture efficiency, or; • provide an acceptable justification to the Environment Agency that a 95% capture rate is not reasonably achievable and that no further remedial action is to be taken.	Within 15 months of the completion of commissioning
IC24	Black Start Operations LCP689 A written report shall be submitted to the Environment Agency for assessment and written approval. The report shall contain an impact assessment demonstrating that there is no significant environmental risk associated with black start operations for activity AR1 in table S1.1 (Keadby 3) and propose a methodology for minimisation of environmental impact during such a period of operation and for reporting instances of black start operation. The plant can be operated as set out in condition 2.3.9 of the permit once the report has been approved by the Environment Agency. The methodology for operation and reporting set out in the report shall be implemented by the Operator from the date of approval by the Environment Agency.	Within 6 months of the issue of variations V011, V012 & V013.

IC25	**Rated thermal input for activity AR1 in table S1.1** The Operator shall submit a written report to the Environment Agency for assessment and written approval which provides the net rated thermal input for LCP689. Evidence to support the net rated thermal input figure, in order of preference, shall be in the form of: a) Performance test results* during contractual guarantee testing or at commissioning (quoting the specified standards or test codes). b) Performance test results after a significant modification (quoting the specified standards or test codes). (substantial variation only) c) Manufacturer's contractual guarantee value. d) Published reference data, e.g., Gas Turbine World Performance Specifications (published annually). e) Design data, e.g., nameplate rating of a boiler or design documentation for a burner system. f) Operational efficiency data as verified and used for heat accountancy purposes. g) Data provided as part of Due Diligence during acquisition. *Performance test results shall be used if these are available.	Within 12 months of the date of the first fire of LCP689 or as otherwise agreed in writing with the Environment Agency
IC26	**Selective Catalytic Reduction Performance and Optimisation Report (Keadby 3 – LCP689)** If Selective Catalytic Reduction (SCR) is to be used on site in LCP689, the Operator shall submit a written report to the Environment Agency for assessment and written approval describing the performance and optimisation of the Selective Catalytic Reduction (SCR) system and combustion settings to minimise oxides of nitrogen (NOx) emissions within the emission limit values described in this permit with the minimisation of nitrous oxide (N_2O) emissions. The report shall include: • an assessment of the level of NOx and N_2O emissions that can be achieved under optimum operating conditions; and • an assessment of ammonia (NH_3) slippage.	Within 4 months of the completion of commissioning of Keadby 3.
IC27	**Solvent degradation (Keadby 3 carbon capture plant)** The Operator shall submit a written report to the Environment Agency for assessment and written approval on the degradation of absorber solvent quality. The report shall review the findings from the monitoring of absorber solvent quality over 12 months of operation, including but not limited to the monitoring carried out in accordance with table S3.3 of this permit. The report shall include: • an investigation into the reasons for solvent degradation and how degradation effects the performance of the plant over time. • a review of the options for reducing the rate of solvent degradation; and proposals for the implementation of any measures identified from the review. The proposals shall be implemented in accordance with Environment Agency's written approval.	15 months from the completion of commissioning of Keadby 3.

IC28	**Annual CO emissions - activity AR1 in table S1.1 (Keadby 3)** The Operator shall submit a written report to the Environment Agency for assessment and written approval on their proposed achievable emission limit value (ELV) for CO. The ELV shall be expressed as a**n annual mean of validated hourly averages**, supported by a summary of emissions data.	Within 6 months of the completion of commissioning

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
PO1	**Commissioning Plan (Keadby 3 - LCP689 and CCP)** At least 3 months prior to the commencement of commissioning of activities AR1 & AR2 in table S1.1 (Keadby 3 and associated carbon capture plant), the Operator shall submit a written commissioning plan, including timelines for completion, for assessment and written approval by the Environment Agency. The commissioning plan shall include, but not be limited to: • the timelines for the commissioning and the expected durations of these activities. • the expected emissions to the environment during the different stages of commissioning; risk assessment demonstrating that the environmental risks are not significant throughout all the phases of commissioning; the expected durations of commissioning activities and the actions to be taken to protect the environment and report to the Environment Agency in the event that actual emissions exceed expected emissions. • proposal for the validation of the approved noise assessment that is submitted in response to pre-operational condition PO6 in this table. • a methodology for approval to demonstrate the carbon capture efficiency of the plant. The approved methodology shall be used to demonstrate the carbon capture efficiency of the plant as part of the commissioning activities, and, after the commissioning phase, for process monitoring and reporting purposes in compliance with the conditions of the permit. • a methodology for approval for quantifying total mass of CO_2 emissions during short duration venting that may be required during the start-up sequence of the carbon capture plant and during other than normal operating conditions. The commissioning activities shall be carried out in accordance with the commissioning plan approved by the Environment Agency.
PO2	**Intensive monitoring exercise 1 Plan (Keadby 3 - LCP689 and CCP)** At least 2 weeks before operation of activities AR1 & AR2 in table S1.1 (Keadby 3 and associated carbon capture plant), the Operator shall submit a written plan to the Environment Agency for technical assessment and approval, setting out proposals for a period of intensive isokinetic sampling and monitoring of emission points A105a and A105b which will be carried out to establish the emission concentrations of NO_x, CO, SO_2, SO_3, ammonia, acetaldehyde, formaldehyde, ketones, acetic acid, Total Amines, MEA, MDEA, DEA, EA, DMA, MOR, PZ, MMA, ammonia acetaldehyde, speciated nitrosamines and total nitrosamines and nitramines (as per table S3.1). The length of this period and number of samples required will be dependent on how consistent the emissions are, and should be sufficient to provide confidence in the results and their consistency. The proposals shall include details of the monitoring programme including the MCERTS site specific protocol for the Environment Agency to agree, or other agreed site specific protocol where MCERTS is not available.
PO3	**Decommissioning Plan (Keadby 3 - LCP689 and CCP)**

	Prior to the commencement of operation of activities AR1 & AR2 in table S1.1 (Keadby 3 and associated carbon capture plant), the Operator shall submit a decommissioning plan to the Environment Agency, that has been updated to reflect the changes made in variation V011 and incorporates Keadby 3 and the associated Carbon Capture Plant.
PO4	**Use of Selective Catalytic Reduction (Keadby 3 - LCP689)** Prior to the commencement of operations of activity AR1 in table S1.1 (Keadby 3), the Operator shall confirm whether Selective Catalytic Reduction (SCR) will be utilised on the activity. If SCR is to be used, the Operator shall submit to the Environment Agency for assessment and approval a revised emissions to air risk assessment for human health and ecological receptors ensuring the inclusion of any changes to emissions to air process contributions (such as ammonia and nutrient nitrogen deposition).
PO5	**Waste Management Procedure (Keadby 3 - LCP689 and CCP)** Prior to the commencement of operation of activities AR1 & AR2 in table S1.1 (Keadby 3 and the associated carbon capture plant), the Operator shall submit a written report to the Environment Agency, for assessment and written approval, which explains the on-site Waste Management Procedure that takes into account the waste hierarchy. The waste procedure should specifically focus on, but not be limited to, the fate of the acid scrubber liquor from the absorber stacks, the CO_2 staged compression dehydration effluent and the treated flue gas cooling (DCC) effluent.
PO6	**Noise Impact Assessment / Noise Management Plan (Keadby 3 - LCP689 and CCP)** Prior to the commencement of operation of activities AR1 & AR2 in table S1.1 (Keadby 3 and the associated carbon capture plant), the Operator shall submit a revised Noise Impact Assessment (NIA) and Noise Management Plan to the Environment Agency, for assessment and written approval, which validates the assumptions made in the submitted NIA submitted in V011, once the finalised design parameters have been ascertained for Keadby 3, and to ensure that adequate mitigation measures are installed on-site to address existing noise emissions from Keadby 2. The assessment shall also include consideration of CO_2 venting as a noise source. The NIA shall be in accordance with BS4142:2014 (Rating industrial noise affecting mixed residential and industrial areas) or other methodology as agreed with the Environment Agency.
PO7	**CO_2 venting emissions to air assessment validation (Keadby 3 - CCP)** Prior to the commencement of operations of activity AR2 in table S1.1 (Carbon Capture Plant– Keadby 3), the Operator shall submit to the Environment Agency for assessment and written approval: • a report that validates the assumptions used in the CO_2 venting emissions to air risk assessment, these shall include but not be limited to: o Confirmation of the vent locations o Confirmation of the maximum release duration (submitted modelling assumes 90 minutes at any one time) o Confirmation of maximum CO_2 release rate (submitted modelling assumes 83.2 kg/s) and minimum exhaust temperature (submitted modelling assumes 23°C) o Confirmation of vent stack heights and indicative combined diameters (submitted modelling assumes a height of 50 – 92m and combined diameters of 51” or 36”) o Confirmation of any surrounding structures that may affect downwash or interfere with the plume (based on the modelling assumption) • If any of the input parameters to the CO_2 venting assessment are different to those assumed in the assessment submitted in variation V011, the Operator shall submit an updated assessment of the impact of CO_2 emissions on human health from short duration venting that may be required during the start-up sequence of the carbon capture plant, during other than normal operating conditions and plant commissioning. The assessment shall be carried out in accordance with environmental risk

	assessment methodology set out in Environment Agency guidance https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit and Environmental permitting: air dispersion modelling reports - GOV.UK (www.gov.uk). Your assessment must show that CO_2 concentrations at locations of public exposure are below the levels at which onset of symptoms and effects are reported. • The Operator shall submit a management plan detailing operating techniques to minimise potential CO_2 phase changes, solid effects and dense gas behaviour when venting CO_2 to atmosphere.
PO8	**Recovery of heat (Keadby 3 - LCP689 and CCP)** Prior to the commencement of commissioning of Keadby 3, the Operator shall submit a written report to the Environment Agency for assessment and written approval on heat recovery options. The report shall include: • a comprehensive review of the options available for utilising the heat generated by the combustion process in order to ensure that it is recovered as far as practicable; • the review shall detail any identified proposals for improving the recovery and utilisation of waste heat and shall provide a timetable for their implementation. The proposals shall be implemented in accordance with the Environment Agency's written approval.
PO9	**Air quality assessment (Keadby 3 - LCP689 and CCP)** Following the completion of the final design of Keadby 3 and at least 6 months prior to the commencement of commissioning, the Operator shall submit an updated air quality assessment (for emission points A105a, A105b, A106, A52, A53 and A54) for assessment and written approval by the Environment Agency. The assessment shall review and update the air quality risk assessment submitted with the permit application and be carried out in accordance with environmental risk assessment methodology set out in Environment Agency guidance https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit.
PO10	**Process monitoring methods (Keadby 3 - LCP689 and CCP)** Following the completion of the final design of the installation and at least 6 months prior to the commencement of commissioning of Keadby 3, the Operator shall submit to the Environment Agency for assessment and written approval methodologies for the following process monitoring requirements for absorber amine solvent quality as required in table S3.3 of this permit: • percent active amine (MEA) • carbon dioxide loading (rich amine) • heat stable salts • soluble iron concentration (rich and lean amine) • colour • degradation products – including but not limited to amines, nitrosamines (in absorber amine solvent prior to reclaiming and after reclaiming
PO11	**CO_2 staged compression dehydration effluent (Keadby 3 - LCP689 and CCP)** Following the completion of the final design of Keadby 3 and at least 6 months prior to the commencement of commissioning, the Operator shall submit to the Environment Agency for

	assessment and written approval, methodologies for the pre-compression dehydration of Carbon Dioxide from the Carbon Capture Plant. The assessment shall review the potential impact of introducing triethylene glycol (TEG), or any other proposed dehydration solvent, into the solvent loop of the Carbon Capture Plant and review and update the air quality risk assessment submitted with the permit application as necessary. The assessment should be carried out in accordance with the environmental risk assessment methodology set out in Environment Agency Guidance: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit.
PO12	**Confirmation of pre-FEED design assumptions (Keadby 3 - LCP689 and CCP)** Following the completion of the final design of Keadby 3 and at least 6 months prior to the commencement of commissioning, the Operator shall submit to the Environment Agency for assessment and written approval, confirmation of the final design of all plant to validate assumptions made in submissions for variation V011. Where the final design of the plant differs from those assumed in submissions for variation V011, the Operator shall reassess any effects on emissions in accordance with the environmental risk assessment methodology set out in Environment Agency Guidance: Risk assessments for your environmental permit - GOV.UK (www.gov.uk) and confirm compliance with guidance: Post-combustion carbon dioxide capture: emerging techniques (Post-combustion carbon dioxide capture: emerging techniques - GOV.UK (www.gov.uk)).
PO13	**PCC other than normal operating conditions (OTNOC) plan (Keadby 3 - LCP689 and CCP)** Following the completion of the final design of Keadby 3 and at least 6 months prior to the commencement of commissioning of Keadby 3, the Operator shall submit to the Environment Agency for assessment and written approval a post combustion carbon capture (PCC) plant other than normal operating conditions (OTNOC) management plan. The plan shall set out any potential OTNOC for the PCC plant, taking into consideration both internal and external causes of OTNOC. OTNOC shall include periods of start-up and shut-down and the plan shall detail measures to: (i) minimise the occurrence of OTNOC that are within Operator control except for periods of start-up and shut-down associated with dispatchable power generation; and (ii) (ii) reduce the impact of all OTNOC events. The plan shall also set out proposals for measuring and reporting carbon capture performance during periods of start-up and shut-down; and proposals for reviewing and optimising capture performance periodically so capture rates are as high as reasonably practical during these periods**.**

Table S1.5 Start-up and Shut-down thresholds		
Emission Point and Unit Reference	**"Minimum Start-Up Load"** **Load in MW and as percent of rated power output (%)**	**"Minimum Shut-Down Load"** **Load in MW and as percent of rated power output (%)**
Keadby 1 – A1(a), A1(b), A2(a) and A2(b) LCP202 and LCP203	Flame on Emissions Compliance Mode >166MW gas turbine output, 70%	Flame off Emissions Compliance Mode <90 MW gas turbine output; 38%

Table S1.5 Start-up and Shut-down thresholds		
Emission Point and Unit Reference	**"Minimum Start-Up Load"** **Load in MW and as percent of rated power output (%)**	**"Minimum Shut-Down Load"** **Load in MW and as percent of rated power output (%)**
In combined and open cycle modes burning natural gas		
A3 LCP 204	Flame on Combustion bypass valve <90% >17MW	Flame off Combustion bypass valve>90% <17MW
Keadby 2 – A101 **LCP682** In combined cycle burning natural gas	Flame on Emissions Compliance Mode Gas Turbine Normalised Load>50%	Flame off, Emissions Compliance Mode, Gas Turbine Normalised Load (approx. 30%) minus 5MW
Keadby 3 – A105a, A105b & A106 **LCP689** In combined cycle burning natural gas	To be agreed in writing by the Environment Agency, following the outcome of improvement condition IC15	To be agreed in writing by the Environment Agency, following the outcome of improvement condition IC15

Table S1.6 Dry Low NOx effective definition	
Emission Point and Unit Reference	**Dry Low NOx effective definition** **Load in MW and as percent of rated power output (%)**
CCGT/OCGT	
Keadby 1 – A1(a) & A2(a) & A1(b) & A2(b) LCP202 and LCP203	166MW; 70%
A3 LCP204	17MW; 70%
CCGT	
Keadby 2 – A101 **LCP682**	Gas Turbine Normalised Load >50%
CCGT	
Keadby 3 – **A105a, A105b & A106** **LCP689**	To be agreed in writing by the Environment Agency, following the outcome of improvement condition IC16

Schedule 2 – Raw materials and fuels

Table S2.1 Raw materials and fuels	
Raw materials and fuel description	**Specification**
Natural Gas	-
Gas oil	Not exceeding 0.1% w/w sulphur content
Monoethanolamine (MEA)	Diethanolamine (DEA) not exceeding 0.2% content (unless otherwise agreed with the Environment Agency).

Schedule 3 – Emissions and monitoring

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	50 mg/m^3 DLN effective to baseload Note 1	Monthly mean of validated hourly averages	Continuous	BS EN 14181
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	50 mg/m^3 DLN effective to baseload Note 1	Daily mean of validated hourly averages	Continuous	BS EN 14181
			50 mg/m^3 MSUL/MSDL to baseload Note 2			
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	75 mg/m^3 DLN effective to baseload Note 1	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	40mg/m^3 Note 3 DLN effective to baseload Note 1	Yearly average	Continuous	BS EN 14181
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Carbon Monoxide	100 mg/m^3 DLN effective to baseload Note 1	Monthly mean of validated hourly averages	Continuous	BS EN 14181

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Carbon Monoxide	100 mg/m^3 DLN effective to baseload Note 1	Daily mean of validated hourly averages	Continuous	BS EN 14181
			100 mg/m^3 MSUL/MSDL to baseload Note 2			
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Carbon Monoxide	100 mg/m^3 DLN effective to baseload Note 1	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Carbon Monoxide	100 mg/m^3 Note3 DLN effective to baseload Note 1	Yearly average	Continuous	BS EN 14181
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Sulphur dioxide	-	-	At least every 6 months	Concentration by calculation, as agreed in writing with the Environment Agency
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Oxygen	-	-	Continuous As appropriate to reference	BS EN 14181
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Water vapour	-	-	Continuous As appropriate to reference	BS EN 14181

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Stack gas temperature	-	-	Continuous As appropriate to reference	Traceable to national standards
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Flow	-	-	Continuous As appropriate to reference	EN ISO 16911
A1(a) & A2(a)	LCP202 & LCP203 Gas turbine fired on natural gas	Stack gas pressure	-	-	Continuous As appropriate to reference	Traceable to national standards
A1(a/b) & A2(a/b)	LCP202 & LCP203 Gas turbine fired on natural gas when in open cycle mode	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	150mg/m^3 DLN effective to baseload Note 1	Monthly mean of validated hourly averages	Continuous	BS EN 14181
A1(a/b) & A2(a/b)	LCP202 & LCP203 Gas turbine fired on natural gas when in open cycle mode	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	80mg/m^3 DLN effective to baseload Note 1 80mg/m^3 MSUL/MSDL to baseload Note 2	Daily mean of validated hourly averages	Continuous	BS EN 14181
A1(a/b) & A2(a/b)	LCP202 & LCP203 Gas turbine fired on natural gas when in open cycle mode	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	300mg/m^3 DLN effective to baseload Note 1	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A1(a/b) & A2(a/b)	LCP202 & LCP203 Gas turbine fired on natural gas when in open cycle mode	Carbon Monoxide	110mg/m^3 DLN effective to baseload Note 1 --- 110 mg/m^3 MSUL/MSDL to baseload Note 2	Daily mean of validated hourly averages	Continuous	BS EN 14181
A1(a/b) & A2(a/b)	LCP202 & LCP203 Gas turbine fired on natural gas when in open cycle mode	Carbon Monoxide	100 mg/m^3 DLN effective to baseload Note 1	Monthly mean of validated hourly averages	Continuous	BS EN 14181
A1(a/b) & A2(a/b)	LCP202 & LCP203 Gas turbine fired on natural gas when in open cycle mode	Carbon Monoxide	200 mg/m^3 DLN effective to baseload Note 1	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
A1(a/b) & A2(a/b)	LCP202 & LCP203 Gas turbine fired on natural gas when in open cycle mode	Sulphur dioxide	-	-	Concentration by calculation, every 2 years	Agreed in writing with the Environment Agency
A3	LCP204 Gas turbine fired on natural gas, OCGT	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	55 mg/m^3 (NO and NO_2 expressed as NO_2)	Daily average	At least every six months	BS EN 14792
A3	LCP204 Gas turbine fired on natural gas, OCGT	Carbon Monoxide	110 mg/m^3 DLN effective to baseload Note 1	-	At least every 6 months	BS EN 15058
A3	LCP204 Gas turbine fired on natural gas, OCGT	Sulphur dioxide	-	-	At least every 6 months	Agreed in writing with the Environment Agency

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A3	LCP204 Gas turbine fired on natural gas, OCGT	Oxygen	-	-	Periodic as appropriate to reference	BS EN 14789
A3	LCP204 Gas turbine fired on natural gas, OCGT	Water vapour	-	-	Periodic as appropriate to reference	BS EN 14790
A3	LCP204 Gas turbine fired on natural gas, OCGT	Flow	-	-	Periodic as appropriate to reference	EN ISO 16911 and M2
A3	LCP204 Gas turbine fired on natural gas, OCGT	Stack gas volume flow	-	-	Periodic as appropriate to reference	BS EN 16911 & TGN M2
A3	LCP204 Gas turbine fired on gas oil, OCGT	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	200mg/m^3	Daily average	At least every 6 months	Concentration by calculation
A3	LCP204 Gas turbine fired on gas oil, OCGT	Sulphur dioxide	66mg/m^3	Daily average	At least every 6 months	Concentration by calculation
A3	LCP204 Gas turbine fired on gas oil, OCGT	Dust	10mg/m^3	Daily average	At least every 6 months	Concentration by calculation
A1(a), A1(b), A2(a), A2(b) & A3	LCP202 & LCP203 Gas turbine fired on natural gas and/or LCP204 Gas turbine fired on Natural gas/gas oil	As required by the Method Implementation Document for BS EN 15259	-	-	Pre-operation and when there is a significant operational change	BS EN 15259
A4 & A5	Gas heaters 1 & 2	-	-	-	-	-

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A6 Auxiliary Boiler	AB01 Boiler plant fired on natural gas	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	-	-	-	-
A6 Auxiliary Boiler	AB01 Boiler plant fired on distillate oil	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	-	-	-	-
A7 – A10	Emergency diesel engines exhausts 1 – 4	-	-	-	-	-
A101	LCP682 Gas turbine fired on natural gas	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	50mg/m^3 DLN effective to baseload Note 1	Monthly mean of validated hourly averages	Continuous	BS EN 14181
A101	LCP682 Gas turbine fired on natural gas	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	45.4 mg/m^3 Note 4 DLN effective to baseload Note 1	Daily mean of validated hourly averages	Continuous	BS EN 14181
			45.4 mg/m^3 Note 4 MSUL/MSDL to baseload Note 2			
A101	LCP682 Gas turbine fired on natural gas	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	75mg/m^3 DLN effective to baseload Note 1	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
A101	LCP682 Gas turbine fired on natural gas	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	34.1mg/m^3 Note 4 DLN effective to baseload Note 1	Yearly average	Continuous	BS EN 14181

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A101	LCP682 Gas turbine fired on natural gas	Carbon monoxide	100 mg/m^3 DLN effective to baseload Note 1	Monthly mean of validated hourly averages	Continuous	BS EN 14181
A101	LCP682 Gas turbine fired on natural gas	Carbon monoxide	100 mg/m^3 DLN effective to baseload Note 1	Daily mean of validated hourly averages	Continuous	BS EN 14181
			100 mg/m^3 MSUL/MSDL to baseload Note 2			
A101	LCP682 Gas turbine fired on natural gas	Carbon monoxide	100 mg/m^3 DLN effective to baseload Note 1	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
A101	LCP682 Gas turbine fired on natural gas	Carbon monoxide	100 mg/m^3 DLN effective to baseload Note 1	Yearly average	Continuous	BS EN 14181
A101	LCP682 Gas turbine fired on natural gas	Sulphur dioxide	-	-	At least every 6 months	Concentration by calculation, as agreed in writing with the Environment Agency
A101	LCP682 Gas turbine fired on natural gas	NH_3	3.8 mg/m^3 Note 1	Yearly average or average over the sampling period	Continuous	BS EN 14181
A101	LCP682 Gas turbine fired on natural gas	Oxygen	-	-	Continuous As appropriate to reference	BS EN 14181
A101	LCP682 Gas turbine fired on natural gas	Flow	-	-	Continuous As appropriate to reference	EN ISO 16911

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A101	LCP682 Gas turbine fired on natural gas	Water vapour	-	-	Continuous As appropriate to reference	BS EN 14181
A101	LCP682 Gas turbine fired on natural gas	Stack gas temperature	-	-	Continuous As appropriate to reference	Traceable to national standards
A101	LCP682 Gas turbine fired on natural gas	Stack gas pressure	-	-	Continuous As appropriate to reference	Traceable to national standards
A101	LCP682 Gas turbine fired on natural gas	As required by the Method Implementation Document for BS EN 15259	-	-	Pre-operation and when there is a significant operational change	BS EN 15259
A102	LCP682 Emergency generator 3MWth	-	-	-	-	-
A103	Fuel gas heater	NOx	100 mg/m^3	Periodic, average over one hour	At least every 3 years	BS EN 14792
A104	Water heating system – gas fired	NOx	100 mg/m^3	Periodic, average over one hour	At least every 3 years	BS EN 14792
A105a & A105b	LCP689 Carbon Capture Absorber Tower Stack	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	45.1 mg/m^3 Effective DLN to baseload Note 6, Note 9	Daily mean of validated hourly averages	Continuous	BS EN 14181

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
			45.1 mg/m^3 MSUL/MSDL to be confirmed following completion of IC15 Note 7, Note 9			
		Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	33.8 mg/m^3 Effective DNL to baseload Note 6, Note 9	Yearly Average	Continuous	BS EN 14181
		Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	56.4 mg/m^3 Effective DNL to baseload Note 6, Note 9	Monthly mean of validated hourly averages	Continuous	BS EN 14181
		Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	112.7 mg/m^3 Effective DNL to baseload Note 6, Note 9	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Carbon Monoxide (CO)	124.0 mg/m^3 Effective DNL to baseload Note 6, Note 9	Daily mean of validated hourly averages	Continuous	BS EN 14181

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
			124.0 mg/m^3 MSUL/MSDL to be confirmed following completion of IC15 Note 7, Note 9			
		Carbon Monoxide (CO)	112.7 mg/m^3 Effective DNL to baseload Note 6, Note 9	Monthly mean of validated hourly averages	Continuous	BS EN 14181
		Carbon Monoxide (CO)	112.7 mg/m^3 Effective DNL to baseload Note 6, Note 9	Yearly average	Continuous	BS EN 14181
		Carbon Monoxide (CO)	225.5 mg/m^3 Effective DNL to baseload Note 6, Note 9	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Sulphur dioxide	No limit	-	At least every 6 months	Concentration by calculation, as agreed in writing with the Environment Agency
		Oxygen	No limit	-	Continuous as appropriate to reference period	BS EN 14181

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		Water vapour	No limit	-	Continuous as appropriate to reference period	BS EN 14181
		Stack gas temperature	No limit	-	Continuous as appropriate to reference period	Traceable to national standards
		Stack gas pressure	No limit	-	Continuous as appropriate to reference period	Traceable to national standards
		Carbon dioxide	No limit	-	Continuous as appropriate to reference period	BS EN 14181
		Stack gas volume flow	No limit	-	Continuous	BS EN 16911
		Ammonia (NH_3)	1.0 mg/m^3	Yearly average	Continuous	BS EN 14181

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		Acetaldehyde	5.3 mg/m^3	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, as agreed with the Environment Agency	Isokinetic based on CEN TS 17638
		Total Amines (expressed as MEA) CAS No 141-43-5	5.5 mg/m^3	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		Monoethanolamine (MEA) CAS No 141-43-5		Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		Ethylamine (EA) CAS No 75-04-7	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		Methyl diethanolamine (MDEA) CAS No 105-59-9	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		Diethanolamine (DEA) CAS No 111-42-2	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		Dimethylamine (DMA) CAS No 124-40-3	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		Morpholine (MOR) CAS No 110-91-8	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		Monomethylamine (MMA) CAS No 74-89-5	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		2-(ethylamine) ethanol CAS No 110-73-6	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		Total Nitrosamines expressed as N-nitrosodimethylamine (NDMA) CAS No 62-75-9	0.002 mg/m^3	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		N-nitrosodimethylamine (NDMA) CAS No 62-75-9	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		N-nitrosomorpholine CAS No 59-89-2	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		N-nitrosomethylethylamine CAS No 10595-95-6	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		N-nitrosodiethylamine CAS No 55-18-5	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		N-nitrosodiisopropylamine CAS No 601-77-4	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		N-nitrosodipropylamine CAS No 621-64-7	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		N-nitrosodibutylamine CAS No 924-16-3	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		N-nitrosodibenzylamine CAS No 5336-53-8	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		N-(2-hydroxyethyl)ethylene diamine CAS No. 111-41-1	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		N-nitrosomorpholine CAS No. 59-89-2	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		N-nitrosodiethanolamine (NDELA) CAS No. 1116-54-7	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		N-nitrosomethylethylamine CAS No. 10595-95-6	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		N-nitrosopyrrolidine CAS No. 930-55-2	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		N-nitrosodibenzylamine CAS No. 5336-53-8	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic impinger method based on EN 14791 to be agreed with the Environment Agency in writing
		Formaldehyde	0.5 mg/m^3	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	Isokinetic CEN TS 17638, or as agreed in writing with the Environment Agency
		Ketones	5.0 mg/m^3	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	US EPA Method 316 or CEN TS 13649, or as agreed in writing with the Environment Agency
		Acetic Acid	-	Periodic average over the sampling period	Monthly until the requirements of IC20 have been agreed, then as agreed with the Environment Agency	US EPA Method 316 or CEN TS 13649, or as agreed in writing with the Environment Agency

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		As required by the Method Implementation Document for BS EN 15259 (Homogeneity test)			Pre-operation and when there is a significant operational change	BS EN 15259
A106	Emissions from HRSG stack LCP689 gas turbine fired on natural gas Heat Recovery Steam Generator (HRSG – applicable only when operating in CO_2 unabated mode)	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	40 mg/m^3 Effective DLN to baseload Note 6	Daily mean of validated hourly averages	Continuous	BS EN 14181
			40 mg/m^3 To be confirmed following completion of IC15 MSUL/MSDL to base load Note 7			
		Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	30 mg/m^3 Effective DLN to baseload Note 6	Yearly Average	Continuous	BS EN 14181
		Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	50 mg/m^3 Effective DLN to baseload Note 6	Monthly mean of validated hourly averages	Continuous	BS EN 14181
		Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	100 mg/m^3 Effective DLN to baseload Note 6	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		Carbon Monoxide (CO)	110 mg/m^3 Effective DLN to baseload Note 6	Daily mean of validated hourly averages	Continuous	BS EN 14181
			110 mg/m^3 To be confirmed following completion of IC15 MSUL/MSDL to base load Note 7			
		Carbon Monoxide (CO)	100 mg/m^3 Effective DLN to baseload Note 6	Monthly mean of validated hourly averages	Continuous	BS EN 14181
		Carbon Monoxide (CO)	100 mg/m^3 Effective DLN to baseload Note 6	Yearly average	Continuous	BS EN 14181
		Carbon Monoxide (CO)	200 mg/m^3 Effective DLN to baseload Note 6	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Sulphur dioxide	-	-	At least every 6 months	Concentration by calculation, as agreed in writing with the Environment Agency

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		Sulphur Trioxide Note 10	-	Daily average or average over sampling period	Once every year	As agreed in writing with the Environment Agency
		Oxygen	-	-	Continuous as appropriate to reference period	BS EN 14181
		Water vapour	-	-	Continuous as appropriate to reference period	BS EN 14181
		Stack gas temperature	-	-	Continuous as appropriate to reference period	Traceable to national standards
		Stack gas pressure	-	-	Continuous as appropriate to reference period	Traceable to national standards
		Carbon dioxide	-	-	Continuous as appropriate to reference period	BS EN 14181
		Stack gas volume flow	-	-	Continuous	BS EN 16911-2

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
		As required by the Method Implementation Document for BS EN 15259 (Homogeneity test)	-	-	Pre-operation and when there is a significant operational change	BS EN 15259
		Ammonia (NH_3)	1.0 mg/m^3	Yearly average	Continuous	BS EN 14181
A107a & A107b location(s) as agreed in accordance with Pre-Operational Condition PO7 in table S1.4 of this permit	LCP689 CO_2 Vents	-	-	-	-	-
A11	Control and Admin Building gas fired domestic boiler exhaust	-	-	-	-	-
A12	Water treatment plant gas fired domestic boiler exhaust	-	-	-	-	-
A13 – A14	Diesel fire foam pumps exhausts	-	-	-	-	-
A15 – A16	Diesel fire foam pumps exhausts	-	-	-	-	-
A17	Workshop and Stores gas fired air heater	-	-	-	-	-
A18	Water treatment plant gas fired air heater	-	-	-	-	-

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A19	Diesel fire water pump building gas fired air heater	-	-	-	-	-
A23	LCP 204 fuel oil (diesel) tank atmospheric vent	-	-	-	-	-
A24	Acid bulk storage tank atmospheric vent	-	-	-	-	-
A25	Bulk caustic storage tank atmospheric vent	-	-	-	-	-
A26 – A28	LCP 202 & LCP 203 & ST generator seal oil vacuum tanks vapour exhaust	-	-	-	-	-
A29 –A31	LCP 202 & LCP 203 & ST Lube oil tank mist eliminator exhausts	-	-	-	-	-
A32	LCP204 Lube oil tank mist eliminator exhaust	-	-	-	-	-
A33 – A34	LCP 202 & LCP 203 False start (waste diesel) drains sump atmospheric vent	-	-	-	-	-
A35 – A36	LCP 202 & LCP 203 HP Gas supply pipe work vent to atmosphere (natural gas)	-	-	-	-	-
A37	AB01 LP Gas supply cork vent to atmosphere (natural gas)	-	-	-	-	-

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A38 – A40	LCP 202, LCP 203 & LCP 204 Inter stage vents to atmosphere (natural gas)	-	-	-	-	-
A41 – A43	LCP 202 & LCP 203 & ST Generator hydrogen supply gas control system vent to atmosphere	-	-	-	-	-
A44 – A 46	LCP 202 & 203 & ST Generator seal oil gas (hydrogen) exhauster fan vents to atmosphere	-	-	-	-	-
A47 – A49	LCP 202 & LCP 203 & ST Battery Room exhauster vents to atmosphere	-	-	-	-	-
A50	Station Battery Room exhauster vent to atmosphere	-	-	-	-	-
A51	Station natural gas HP supply coalesce condensate drains tank atmospheric vent	-	-	-	-	-
A52	Emergency diesel generator - Keadby 3 CCGT LCP689	-	-	-	-	-

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location Note 8	**Source**	**Parameter**	**Limit (including unit)** Note 5	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A53	Emergency diesel generator - Keadby 3 CCP	-	-	-	-	-
A54	Diesel fire water pump for Keadby 3	-	-	-	-	-

Note 1: This emission limit applies when DLN is effective as defined in Table S1.6 of this permit.

Note 2: This emission limit applies from MSUL/MSDL to base load as defined in Table S1.5 of this permit.

Note 3: This emission limit applies to operation >1500hrs/yr.

Note 4: This emission limit is based on efficiency allowances from the LCP BREF: Yearly average NOx = 30 x (62.5%/55%) = 34.1 mg/Nm^3 Daily mean of validated hourly averages.

Note 5: The limits do not apply during start-up or shut-down.

Note 6: This limit applies between the effective dry low NO_x threshold and baseload once IC16 in table S1.3 of this permit has been completed. Effective dry low NO_x thresholds are defined in table S1.6 of this permit, until IC16 has been completed compliance with ELVs will be based on 70% to baseload.

Note 7: This limit applies from MSUL/MSDL to baseload once IC15 has been completed. MSUL/MSDL thresholds are defined in table S1.6, until IC15 has been completed compliance will be based on 70% to baseload.

Note 8: Emission points on site plan in Schedule 7 of this permit.

Note 9: This emission limit is based on the normalised flue gas volume (for CO_2 removal and Oxygen normalisation) & standardised CO_2 capture level: ELV = (unabated limit x (1 – standardised residual (abated) CO_2 %)) / (1 – normalised unabated CO_2 %) x (21-15)/(21-15)/(1 – normalised unabated CO_2 %)/(1 – standardised residual (abated) CO_2 %). Standardised residual (abated) CO_2 assumed to be 0.17% (95% capture efficiency), normalised oxygen is assumed to be 15% and normalised unabated CO_2 is assumed to be 3.4%.

Note 10: This monitoring is required if SCR is to be used on LCP689.

Table S3.2 Point source emissions to water (other than sewer) and land – emission limits and monitoring requirements							
Emission point ref. & location	**Source**	**Parameter**	**Limit (incl. unit)**		**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
Keadby 1							
W1 on site plan in Schedule 7 (emission to River Trent at grid reference (SE 83652 12223)	- cooling water - water from water treatment plant (including regeneration effluent from W8 - surface drainage from lube oil unloading area via tilt plate separator and pump pit - roadways at South East area, via tilt plate separator and pump pit - chemical tanker offload area via interceptor sump - bulk chemical storage bunds via effluent neutralisation sumps boiler - abstracted excavation de-waterings from excavation to a	Daily maximum flow	15 m^3/sec		Average of 24-hour period beginning 00:01hrs	Daily	MCERTS
		Oil or Grease	No visible emission		24-hour period beginning 00:01hrs	Daily	-
		Total Daily Volume	985,670 m^3 (per day) not including surface water treatment		24-hour period beginning 00:01hrs	Continuous	MCERTS
		Cooling water abstraction and discharge temperature differential limit – Normal Operation	Discharge Flow Rate 820,001 to 985,670 m^3/day	13°C (98th %ile) Note 4	Average over 24-hour period beginning 00:01hrs	Continuous	Calibrated resistance thermometer device (RTD) UKAS approved
			Discharge Flow Rate 650,001 to 820,000 m^3/day	16°C (98th %ile) Note 4			
			Discharge Flow Rate	20°C (98th %ile) Note 4			

Table S3.2 Point source emissions to water (other than sewer) and land – emission limits and monitoring requirements							
Emission point ref. & location	**Source**	**Parameter**	**Limit (incl. unit)**		**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
	maximum volume of 6,264m^3/day		470,001 to 650,000 m^3/day				
		Cooling water abstraction and discharge temperature differential limit - One Pump scenario	Discharge Flow Rate Below 470,000 m^3/day	28°C (98th %ile) Note 5	Average over 24-hour period beginning 00:01hrs	Continuous	Calibrated resistance thermometer device (RTD) UKAS approved
		Mercury	-		-	-	[note 1]
		Cadmium	-		-	-	[note 2]
W2, W3, W5 (emissions to Red House Drain or Kelsey Drain)	Drainage of surface waters from north-east power island, main transformer, amenity blocks, drainage of surface waters from fuel tank farm and Ealand Road area	Oil and grease	No visible emission		Spot	Daily	-
W4, W7 & W9	Removed from permit under partial surrender EPR/YP3133LL/S007 Removed from permit under substantial variation EPR/YP3133LL/V010						
W6	Drainage water from cooling water pump house and oil handling area	Oil and grease	No visible emission		Spot	Daily	-
W8 [note 3]	Ion exchange effluent	pH range	5 – 10		24 hour period beginning 00:01hrs	Continuous	BS6068-2.50
Keadby 2							

Table S3.2 Point source emissions to water (other than sewer) and land – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (incl. unit)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
W10	Discharge of the K2 cooling water outflow including collection, treatment and discharge of cable pull pit water, and rainwater from the vicinity of the cooling towers into the K1 cooling water culvert.	pH	5-10	24 hour period beginning 00:01hrs	Continuous	BS6068-2.50
		Daily maximum flow rate	100 l/s	Average of 24-hour period beginning 00:01hrs	Daily	MCERTS
		Residual chlorine	0.2mg/l Cl_2	-	-	-
		Conductivity	<5000uS/cm	-	-	-
		Oil & grease	No visible emission	Spot	Daily	-
		Absolute Discharge Temperature	35^{o}C	Maximum based on hourly averages	Continuous	Calibrated resistance thermometer device (RTD) UKAS approved
		Cadmium	-	-	-	[note 2]
		Mercury	-	-	-	[note 1]
W11	Rain water from roofs, paved areas and water from oil/water separators and neutralised water from the condensate polishing plant waste water system stored in the detention basin, released using a hydro brake	pH	5 - 10	Spot	Daily	-
		Oil & grease	No visible emission	Spot (visual)	Daily	-

Table S3.2 Point source emissions to water (other than sewer) and land – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (incl. unit)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
Keadby 3						
W12 on Figure 3 site plan in Schedule 7	Discharge of the Keadby 3 cooling water outflow into the Keadby 1 cooling water culvert	pH	6 - 9	24 hour period beginning 00:01hrs	Continuous	BS6068-2.50
		Daily maximum flow rate	83.5 l/s	Average of 24-hour period beginning 00:01hrs	Daily	MCERTS
		Residual chlorine	0.2mg/l Cl_2	-	-	-
		Conductivity	<5000uS/cm	-	-	-
		Oil & grease	No visible emission	Spot	Daily	-
		Absolute Discharge Temperature	35^{o}C	Maximum based on daily averages (Average of 24-hour period beginning 00:01hrs)	Continuous	Calibrated resistance thermometer device (RTD) UKAS approved
		Cadmium	-	-	-	[note 2]
		Mercury	-	-	-	[note 1]

Note 1. The discharge of mercury from the processes shall be controlled by limiting the concentration of mercury or its compounds in the raw materials as: - 46% sodium hydroxide < 500 μg/kg 98% sulphuric acid < 1000 μg/kg water treatment chemicals < 400 μg/kg

Note 2. The discharge of cadmium from the processes shall be controlled by limiting the concentration of cadmium or its compounds in the raw materials as: - 46% sodium hydroxide < 500 μg/kg 98% sulphuric acid < 1000 μg/kg water treatment chemicals < 400 μg/kg

Note 3. pH applies to discharges longer than 10 minutes in duration.

Table S3.2 Point source emissions to water (other than sewer) and land – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (incl. unit)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
Note 4. Based on an ambient summer river temperature of 19.1°C. Note 5. Based on an ambient summer river temperature of 19.1°C, planned maintenance of Keadby 1 pumps shall not be carried out in operational periods during June/July/August (where the ambient river temperature exceeds 19.1°C) unless agreed in writing with the Agency. Emission limits apply when Keadby 1 is operating under the 'one-pump' scenario.						

Table S3.3 Process monitoring requirements				
Emission point reference or source or description of point of measurement	**Parameter**	**Monitoring frequency**	**Monitoring standard or method**	**Other specifications**
Keadby 1				
Cooling waters intake and discharge temperature differential	Temperature ^{O}C	Daily average	Calibrated resistance thermometer device (RTD) UKAS approved	
LCP 202 & LCP203	Net electrical efficiency	After each modification which that could significantly affect these parameters	EN Standards or equivalent	
LCP 204	Net electrical efficiency	After each modification which that could significantly affect these parameters	By calculation	
Keadby 2				
Cooling waters intake and discharge temperature differential	Temperature °C	Daily average	Calibrated resistance thermometer device (RTD) UKAS approved	
LCP 682	Net electrical efficiency	After each modification which that could significantly affect these parameters	EN Standards or equivalent	
Keadby 3				
Cooling waters intake and discharge temperature differential	Temperature °C	Daily average	Calibrated resistance thermometer device (RTD) UKAS approved	
LCP 689 operating in CO_2 abated mode	Net electrical efficiency	Note 2	EN Standards or equivalent	

LCP 689 operating in CO_2 unabated mode	Net electrical efficiency	Note 2.	EN Standards or equivalent	
Absorber amine solvent quality, activity AR2 in table S1.1	Percent active amine (MEA)	1-2 days or otherwise agreed in writing with the Environment Agency	As agreed in writing with the Environment Agency in accordance with PO10 in table S1.4.	-
	Carbon dioxide loading (rich amine)	Every 2 days or otherwise agreed in writing with the Environment Agency		
	Heat stable salts	Every day during the first month of operation then 1 per week, or otherwise agreed in writing with the Environment Agency.		
	Soluble iron concentration – rich amine			
	Soluble iron concentration – lean amine following stripper	Once per week, or otherwise agreed in writing with the Environment Agency		
	Colour	Weekly, or otherwise agreed in writing with the Environment Agency.		
	Degradation products – including but not limited to amines, nitrosamines (in absorber amine solvent prior to reclaiming and after reclaiming)	Monthly, or otherwise agreed in writing with the Environment Agency	BSEN ISO 10695, or otherwise agreed in writing with the Environment Agency	

Carbon Capture Performance from Carbon dioxide captured from combustion gases produced by the CCGT (Activity AR1 – Keadby 3)	Carbon capture efficiency (%) during normal operation Carbon capture efficiency (%) during start-up and shut-down	Continuous	Calculation by method traceable to national standards compliant with UK ETS, to be agreed in writing with the Environment Agency as part of PO7 in table S1.4 of this permit.	At least 95% of carbon dioxide shall be captured over a 12 month rolling period. See Note 1
Venting of CO_2 from the carbon capture plant – venting locations as identified in the assessment provided in response to PO7 in table S1.4 of this permit	- Duration of event - Total mass of CO_2 emissions (tonnes/event)	Event specific, total annual	Calculation by method traceable to national standards compliant with UK ETS, to be agreed in writing with the Environment Agency as part of PO7 in table S1.4 of this permit.	The operator shall identify the root cause of the venting event and consider ways to prevent or reduce the frequency and duration of reoccurrence.
Water consumption of the carbon capture plant and carbon dioxide compression plant	Total volume of water used	Continuous	EN standards for flow monitoring or alternative to be agreed in writing with the Environment Agency as part of PO7 in table S1.4	-

Note 1: Instantaneous and annual average Carbon Capture Efficiency to be monitored. Annual average Carbon Capture Efficiency to be averaged over 1 year of operations (from 1st of January) during normal operation. Excluding periods of OTNOC. OTNOC includes venting of CO_2 during periods of time when the CO_2 transport and storage system is not available due to causes external to the operations of the installation; and periods of start-up and shut-down.

Note 2: Once within 4 months after commissioning, where operating in this mode occurs, and then after each modification which that could significantly affect these parameters, where operating in this mode occurs

Schedule 4 – Reporting

Parameters, for which reports shall be made, in accordance with conditions of this permit, are listed below.

Table S4.1 Reporting of monitoring data			
Parameter	**Emission or monitoring point/reference**	**Reporting period**	**Period begins**
Emissions to air Parameters as required by condition 3.5.1	A1(a) & A2(a) A1(b) & A2(b) & A101	Every 3 months for continuous monitoring	1 January, 1 April, 1 July, 1 October
	A3	Every 6 months for periodic monitoring	1 January, 1 July
	A105a & A105b	Every year where there is an annual average	1 January
	A106	Every 2 years for concentration by calculation	1 January
Operating hours	A1(a), A2(a), A3	Every 3 months	1 January, 1 April, 1 July, 1 October
	A105a, A105b		
	A106		
	A1(b), A2(b)	Every 6 months	1 January, 1 July
	A101	Every 3 months	1 January, 1 April, 1 July, 1 October
Emissions to Water Parameters as required by condition 3.5.1	W1, W2, W3, W5, W6, W7, W8, W9, W10, W11 and W12.	Every 6 months	1 January, 1 July
Number of events - Duration of events - Root cause analysis for each event and preventative / frequency reduction measures Total mass of CO2 emissions (tonnes / event)	Venting from Carbon Capture Plant- venting locations as identified in the assessment provided in response to PO7 in table S1.4 of this permit	Annually	1 January

Table S4.2 Resource Efficiency Metrics	
Parameter	**Units**
Electricity Exported	GWhr
Heat Exported	GWhr
Mechanical Power Provided	GWhr
Fossil Fuel Energy Consumption	GWhr

Table S4.2 Resource Efficiency Metrics	
Parameter	**Units**
Non-Fossil Fuel Energy Consumption	GWhr
Annual Operating Hours	hr
Water Abstracted from Fresh Water Source	m^3
Water Abstracted from Borehole Source	m^3
Water Abstracted from Estuarine Water Source	m^3
Water Abstracted from Sea Water Source	m^3
Water Abstracted from Mains Water Source	m^3
Gross Total Water Used	m^3
Net Water Used	m^3
Hazardous Waste Transferred for Disposal at another installation	t
Hazardous Waste Transferred for Recovery at another installation	t
Non-Hazardous Waste Transferred for Disposal at another installation	t
Non-Hazardous Waste Transferred for Recovery at another installation	t
Waste recovered to Quality Protocol Specification and transferred off-site	t
Waste transferred directly off-site for use under an exemption / position statement	t
Efficiency of carbon dioxide capture (Carbon Capture Plant) during normal operation	%
Efficiency of carbon dioxide capture (Carbon Capture Plant) during start-up and shut-down	%
Total (thermal and electrical) energy use per tonne of carbon dioxide captured (Carbon Capture Plant)	kW/Tonne CO2 captured
Amine solvent usage	t
Ammonia/urea usage (SCR)	t
Total CO_2 captured	t
Total CO_2 vented to atmosphere	t
Water consumption per unit carbon dioxide captured	m^3/t

Table S4.3 Large Combustion Plant Performance parameters for reporting to DEFRA		
Parameter	**Frequency of assessment**	**Units**
Thermal Input Capacity for each LCP	Annually	MW
Annual Fuel Usage for each LCP	Annually	TJ
Total Emissions to Air of NOx for each LCP	Annually	t
Total Emissions to Air of SO2 for each LCP	Annually	t
Total Emissions to Air of Dust for each LCP	Annually	t
Operating Hours for each LCP	Annually	hr
Operating Hours as a five yearly rolling average for LCP 204	Annually	hr

Table S4.4 Reporting forms			
Media/ parameter	**Reporting format**	**Agency recipient**	**Date of form**
Air & Energy	Form IED AR1 – SO_2, NO_x and dust mass emission and energy	National and Area Office	LCP BREF Reporting forms v2.8 Aug 2020 or as agreed in writing with the Environment Agency
LCP	Form IED/LCPBREF HR1 – operating hours	National and Area Office	
Air	Form IED/LCPBREF CON 2 – continuous monitoring	Area Office	
CEMs	Form IED/LCPBREF CEMS – Invalidation Log	Area Office	
Resource Efficiency	Form REM1 – resource efficiency annual report	National and Area Office	
Water	Form water 1 or other form as agreed in writing by the Environment Agency	Area Office	
Sewer	Form sewer 1 or other form as agreed in writing by the Environment Agency	Area Office	
Rolling Malfunction	Form IED/LCPBREF BD1 cumulative Malfunction & breakdown	Area Office	
Malfunction and breakdown	Form LCPBREF MF1 – as required	Area Office	
Black start data	Form LCPBREF BS1 – as required	Area Office	
Carbon Capture Process Monitoring (including CO2 venting) Requirements as required by Table S3.3	Form Process 1 (Carbon Capture Plant) – Process monitoring or other form as agreed in writing by the Environment Agency	Area Office	21/10/2024

Schedule 5 – Notification

These pages outline the information that the operator must provide.

Units of measurement used in information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

If any information is considered commercially confidential, it should be separated from non-confidential information, supplied on a separate sheet and accompanied by an application for commercial confidentiality under the provisions of the EP Regulations.

Part A

Permit Number	
Name of operator	
Location of Facility	
Time and date of the detection	

(a) Notification requirements for any malfunction, breakdown or failure of equipment or techniques, accident, or emission of a substance not controlled by an emission limit which has caused, is causing or may cause significant pollution	
To be notified within 24 hours of detection	
Date and time of the event	
Reference or description of the location of the event	
Description of where any release into the environment took place	
Substances(s) potentially released	
Best estimate of the quantity or rate of release of substances	
Measures taken, or intended to be taken, to stop any emission	
Description of the failure or accident.	

(b) Notification requirements for the breach of a limit	
To be notified within 24 hours of detection unless otherwise specified below	
Emission point reference/ source	
Parameter(s)	
Limit	
Measured value and uncertainty	
Date and time of monitoring	

(b) Notification requirements for the breach of a limit	
To be notified within 24 hours of detection unless otherwise specified below	
Measures taken, or intended to be taken, to stop the emission	
Time periods for notification following detection of a breach of a limit	
Parameter	Notification period

(c) Notification requirements for the breach of permit conditions not related to limits	
To be notified within 24 hours of detection	
Condition breached	
Date, time and duration of breach	
Details of the permit breach i.e. what happened including impacts observed.	
Measures taken, or intended to be taken, to restore permit compliance.	

(d) Notification requirements for the detection of any significant adverse environmental effect	
To be notified within 24 hours of detection	
Description of where the effect on the environment was detected	
Substances(s) detected	
Concentrations of substances detected	
Date of monitoring/sampling	

Part B – to be submitted as soon as practicable

Any more accurate information on the matters for notification under Part A.	
Measures taken, or intended to be taken, to prevent a recurrence of the incident	
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission	

The dates of any unauthorised emissions from the facility in the preceding 24 months.	

Name*	
Post	
Signature	
Date	

* authorised to sign on behalf of the operator

Part C Malfunction or Breakdown of LCP abatement equipment

Permit Number	
Name of operator	
Location of Facility	
LCP Number	
Malfunction or breakdown	
Date of malfunction or breakdown	

(a) Notification requirements for any malfunction and breakdown of abatement equipment as defined by the Industrial Emission Directive*.	
To be notified within 48 hours of abatement equipment malfunction and breakdown	
Time at which malfunction or breakdown commenced	
Time at which malfunction or breakdown ceased	
Duration of the breakdown event in hours and minutes	
Reasons for malfunction or breakdown	
Where the abatement plant has failed, give the hourly average concentration of all measured pollutants.	
Cumulative breakdown operation in current year (at end of present event)	
Cumulative malfunction operation in current year (at end of present event)	
Name**	
Post	

Signature **	
Date	

* See section 3.6 and Appendix E of ESI Compliance Protocol for guidance

** authorised to sign on behalf of the operator

Schedule 6 – Interpretation

“accident” means an accident that may result in pollution.

“Air Quality Risk Assessment” has the meaning given in Annex D of IED Compliance Protocol for Utility Boilers and Gas Turbines.

“application” means the application for this permit, together with any additional information supplied by the operator as part of the application and any response to a notice served under Schedule 5 to the EP Regulations.

“authorised officer” means any person authorised by the Environment Agency under section 108(1) of The Environment Act 1995 to exercise, in accordance with the terms of any such authorisation, any power specified in section 108(4) of that Act.

“average over the sampling period” means the average value of three consecutive measurements of at least 30 minutes each [or as agreed in writing with the Environment Agency].

“average of samples obtained during one year” means the average of the values obtained during one year of the periodic measurements taken with the monitoring frequency set for each parameter.

“background concentration” means such concentration of that substance as is present in:

for emissions to surface water, the surface water quality up-gradient of the site; or

for emissions to sewer, the surface water quality up-gradient of the sewage treatment works discharge.

“base load” means: (i) as a mode of operation, operating for >4000hrs pa; and (ii) as a load, the maximum load under ISO conditions that can be sustained continuously, i.e. maximum continuous rating.

“Black Start” means the procedure to recover from a total or partial shutdown of the UK Transmission System which has caused an extensive loss of supplies. This entails isolated power stations being started individually and gradually being reconnected to other power stations and substations in order to form an interconnected system again.

“breakdown” has the meaning given in the ESI IED Compliance Protocol for Utility Boilers and Gas Turbines.

“calendar monthly mean” means the value across a calendar month of all validated hourly means.

“CEN” means Commité Européen de Normalisation.

“Combustion Technical Guidance Note” means IPPC Sector Guidance Note Combustion Activities, version 2.03 dated 27th July 2005 published by Environment Agency.

“commissioning” means testing of the installation that involves any operation of a Large Combustion Plant referenced in schedule 1, table S1.1 or as agreed with the Environment Agency.

“daily average” means the average over a period of 24 hours of validated hourly averages obtained by continuous measurements.

“disposal” means any of the operations provided for in Annex I to Directive 2008/98/EC of the European Parliament and of the Council on waste.

“DLN” means dry, low NO_x burners.

“dynamic emission limit value” (DELV) means an emission limit that varies in accordance with Article 40 of the Industrial Emissions Directive.

“emergency plant” means a plant which operates for the sole purpose of providing power at a site during an onsite emergency and/or during a black start and which does not provide balancing services or demand side response services.

“emissions of substances not controlled by emission limits” means emissions of substances to air, water or land from the activities, either from the emission points specified in schedule 3 or from other localised or diffuse sources, which are not controlled by an emission or background concentration limit.

“emissions to land” includes emissions to groundwater.

“Energy efficiency” means the annual net plant energy efficiency, the value for which is calculated from the operational data collected over the year.

“EP Regulations” means The Environmental Permitting (England and Wales) Regulations SI 2016 No.1154 and words and expressions used in this permit which are also used in the Regulations have the same meanings as in those Regulations.

“groundwater” means all water, which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.

“Industrial Emissions Directive” means DIRECTIVE 2010/75/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 on industrial emissions, as read in accordance with Schedule 1A to the Environmental Permitting (England and Wales) Regulations 2016.

“large combustion plant” or “LCP” is a combustion plant or group of combustion plants discharging waste gases through a common windshield or stack, where the total thermal input is 50 MW or more, based on net calorific value. The calculation of thermal input, excludes individual combustion plants with a rated thermal input below 15MW.

“low polluting fuels” means biomass or coal with an average as-received sulphur content of less than 0.4% by mass as described in the ESI IED Compliance Protocol for Utility Boilers and Gas Turbines.

“malfunction” has the meaning given in the ESI IED Compliance Protocol for Utility Boilers and Gas Turbines.

“Mid-merit” means combustion plant operating between 1,500 and 4,000 hrs/yr.

“MCERTS” means the Environment Agency’s Monitoring Certification Scheme.

“MCR” means maximum continuous rating.

“MSDL” means minimum shut-down load as defined in Implementing Decision 2012/249/EU.

“MSUL” means minimum start-up load as defined in Implementing Decision 2012/249/EU.

“Natural gas” means naturally occurring methane with no more than 20% by volume of inert or other constituents.

“ncv” means net calorific value.

“Net electrical efficiency” means the ratio between the net electrical output (electricity produced minus the imported energy) and the fuel/feedstock energy input (as the fuel/feedstock lower heating value) at the combustion unit boundary over a given period of time.

“Net mechanical energy efficiency” means the ratio between the mechanical power at load coupling and the thermal power supplied by the fuel.

“Net total fuel utilisation” means the ratio between the net produced energy minus the imported electrical and/or thermal energy and the fuel energy input at the combustion unit boundary over a given period of time.

“non-emergency plant” means a plant which provides balancing services or demand side response services.

“operational hours” are whole hours commencing from the first unit ending start up and ending when the last unit commences shut down.

“quarter” means a calendar year quarter commencing on 1 January, 1 April, 1 July or 1 October.

“SI” means site inspector.

“Standby fuel” means alternative liquid fuels that are used in emergency situations when the gas fuel which is normally used, is not available.

Where a minimum limit is set for any emission parameter, for example pH, reference to exceeding the limit shall mean that the parameter shall not be less than that limit.

Unless otherwise stated, any references in this permit to concentrations of substances in emissions into air means:

- in relation to emissions from combustion processes, the concentration in dry air at a temperature of 273K, at a pressure of 101.3 kPa and with an oxygen content of 3% dry for liquid and gaseous fuels, 6% dry for solid fuels; and/or
- in relation to emissions from gas turbine or compression ignition engine combustion processes, the concentration in dry air at a temperature of 273K, at a pressure of 101.3kPa and with an oxygen content of 15% dry for liquid and gaseous fuels; and/or
- in relation to emissions from combustion processes comprising a gas turbine with a waste heat boiler, the concentration in dry air at a temperature of 273K, at a pressure of 101.3kPa and with an oxygen content of 15% dry, unless the waste heat boiler is operating alone, in which case, with an oxygen content of 3% dry for liquid and gaseous fuels; and/or
- in relation to emissions from non-combustion sources, the concentration at a temperature of 273K and at a pressure of 101.3 kPa, with no correction for water vapour content.

“year” means calendar year ending 31 December.

“yearly average” means the average over a period of one year of validated hourly averages obtained by continuous measurements.

Schedule 7 – Site plan

Figure 1 – Site Boundary with emission points for Keadby 1 and Keadby 2

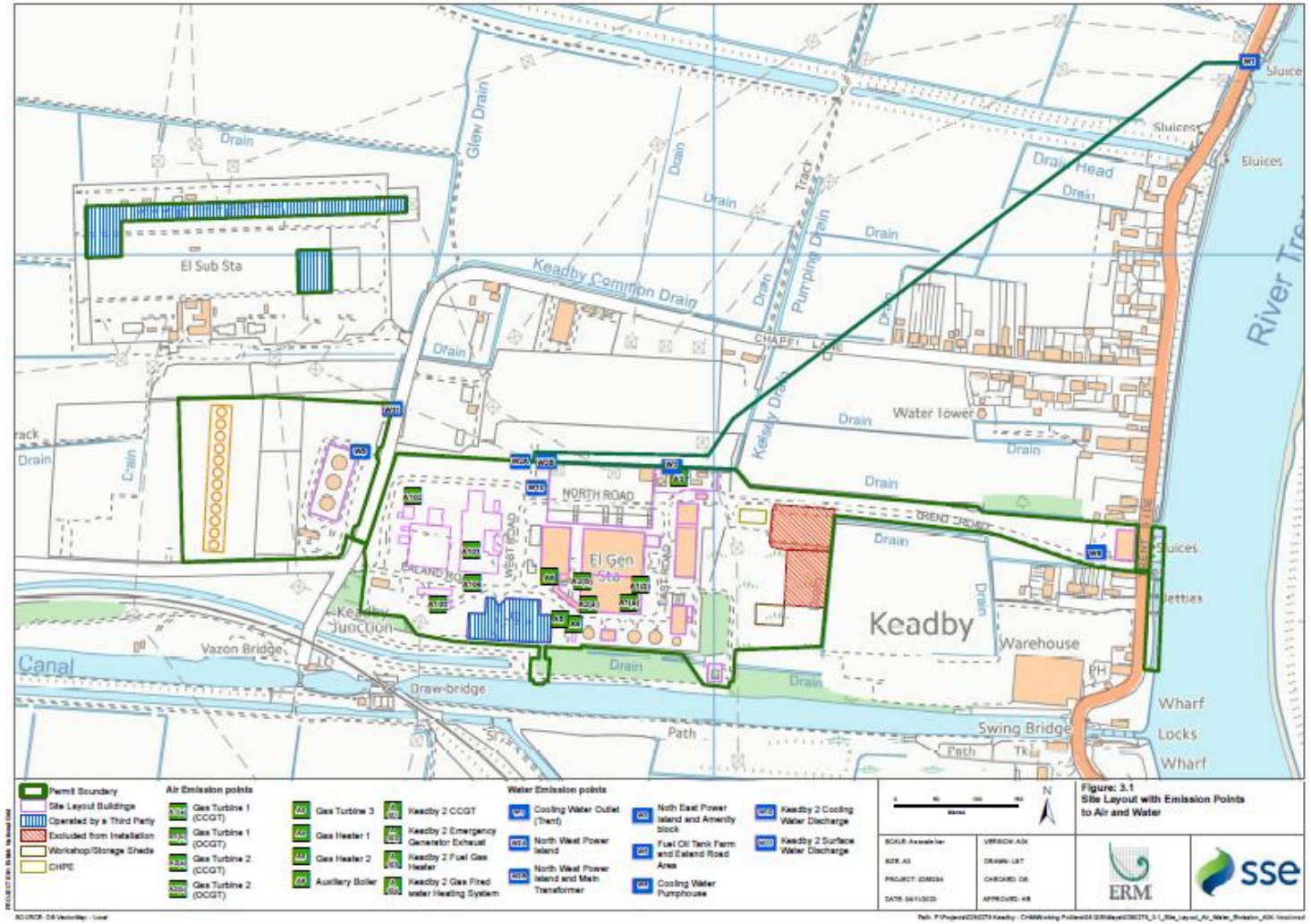


Figure 2 – Emission Points for Keadby 3

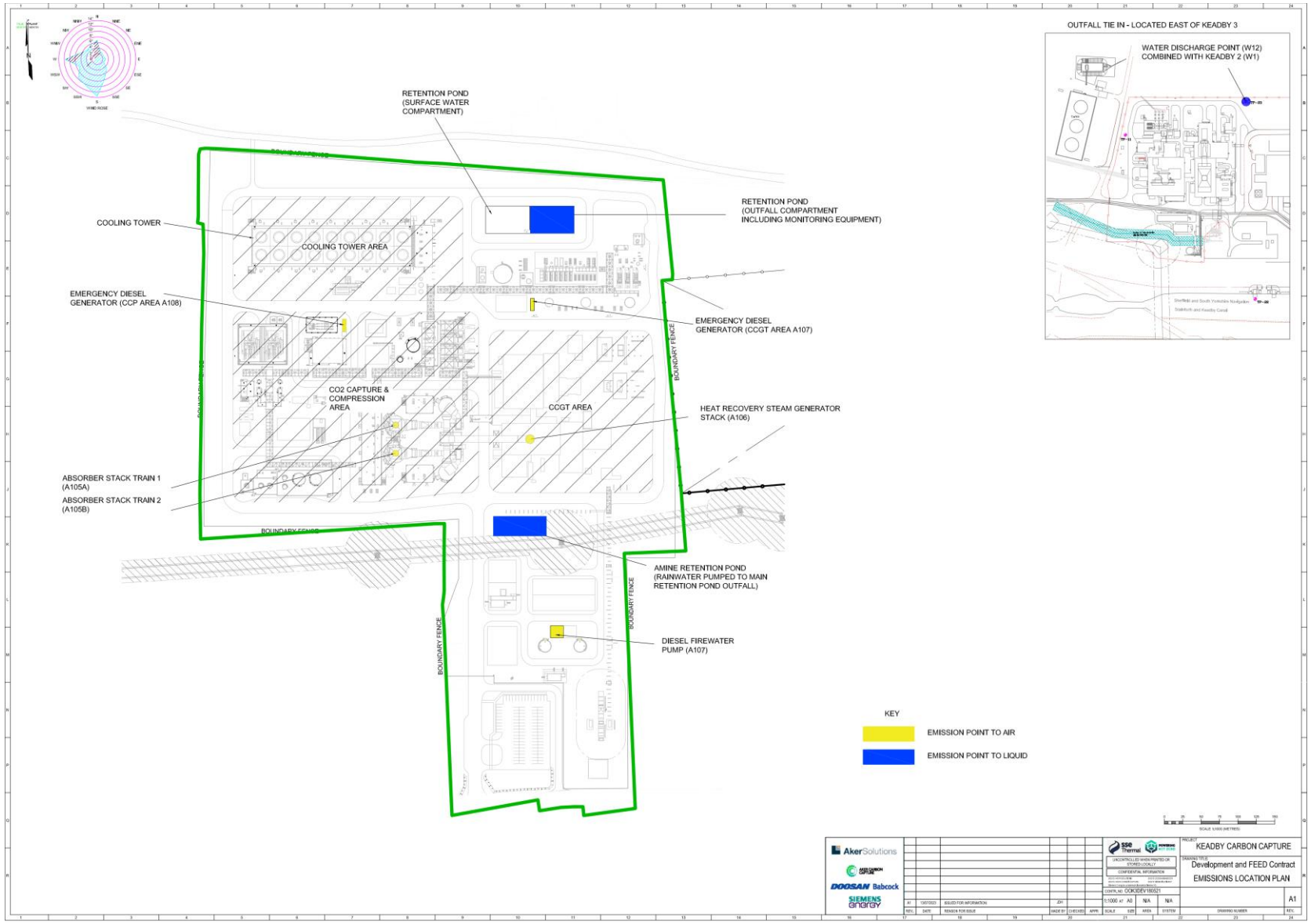
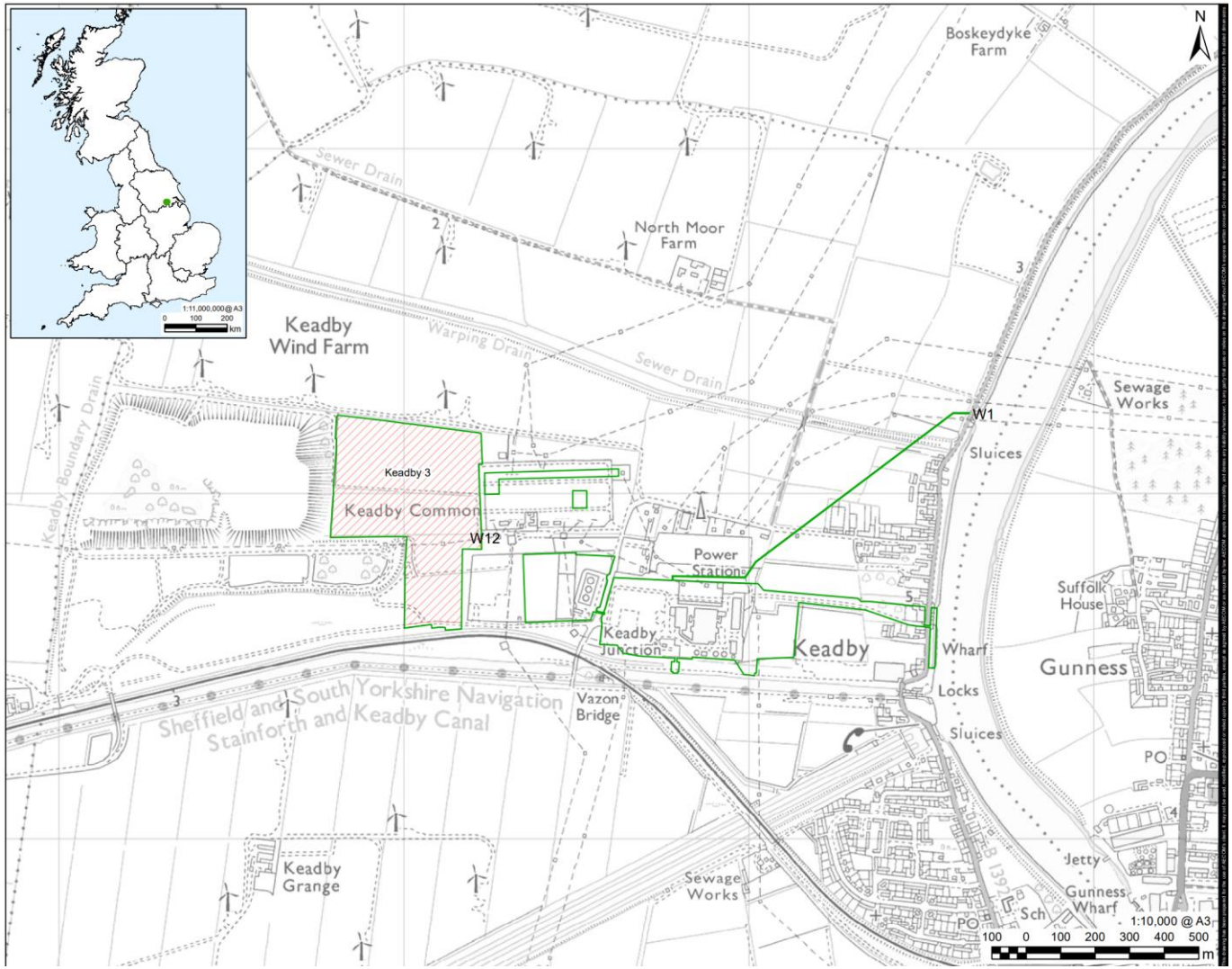


Figure 3 – Site Boundary post Keadby 3 construction



END OF PERMIT