Determination of an Application for an Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2016

Consultation on our decision document recording our decision-making process

The Permit Number is: EPR/QP3724SE

The Applicant / Operator is: Viridor Energy Runcorn CCUS Limited

The Installation is located at: Runcorn CC Facility, Barlow Way, Runcorn, Cheshire, WA7 4HG

Consultation commences on: 16/05/2025
Consultation ends on: 23/06/2025

What this document is about

This is a draft decision document, which accompanies a draft permit.

It explains how we have considered the Applicant's Application, and why we have included the specific conditions in the draft permit we are proposing to issue to the Applicant. It is our record of our decision-making process, to show how we have taken into account all relevant factors in reaching our position. Unless the document explains otherwise, we have accepted the Applicant's proposals.

The document is in draft at this stage because we have yet to make a final decision. Before we make this decision, we want to explain our thinking to the public and other interested parties, to give them a chance to understand that thinking and, if they wish, to make relevant representations to us. We will make our final decision only after carefully taking into account any relevant matter raised in the responses we receive. Our mind remains open at this stage. Although we believe we have covered all the relevant issues and reached a reasonable conclusion, our ultimate decision could yet be affected by any further information that may be provided that is relevant to the issues we have to consider. However, unless we receive information that leads us to alter the conditions in the draft Permit, or to reject the Application altogether, we will issue the Permit in its current form.

In this document we frequently say "we have decided". That gives the impression that our mind is already made up; but as we have explained above, we have not yet done so. The language we use enables this document to become the final decision document in due course with no more re-drafting than is absolutely necessary.

We try to explain our decision as accurately, comprehensively and plainly as possible. Achieving all three objectives is not always easy, and we would welcome any feedback as to how we might improve our decision documents in future. A lot of technical terms and acronyms are inevitable in a document of this nature: we provide a glossary of acronyms near the front of the document, for ease of reference.

Preliminary information and use of terms

We gave the application the reference number EPR/QP3724SE/A001. We refer to the application as "the **Application**" in this document in order to be consistent.

The number we propose to give to the permit is EPR/QP3724SE. We refer to the proposed permit as "the **Permit**" in this document.

The Application was duly made on 02/02/2024.

The applicant is Viridor Energy Runcorn CCUS Limited. We refer to Viridor Energy Runcorn CCUS Limited as "the **Applicant**" in this document. Where we are talking about what would happen after the Permit is granted (if that is our final decision), we call Viridor Energy Runcorn CCUS Limited "the **Operator**".

Viridor Energy Runcorn CCUS Limited's proposed facility is located at Runcorn CC Facility, Barlow Way, Runcorn, WA7 4HG.

The carbon capture facility operated by the Applicant will be a multi operator installation with Viridor Energy Limited. Viridor Energy Limited is the operator of Runcorn Energy from Waste Facility located at Barlow Way, Runcorn, WA7 4HG. The carbon capture facility will accept treated flue gases from the existing energy from waste facility. The permit number of Runcorn Energy from Waste Facility is EPR/XP3005LB. We refer to the multi-operator installation as "the **Installation**". We refer to the carbon capture facility as "the **CC plant**" and the Energy from Waste facility as "the **incineration plant**" in this document.

The proposed application

The Applicant has applied to operate an amine-based (Monoethanolamine, MEA) carbon capture activity in accordance with section 6.10 Part A(1) (a) of schedule 1 to the Environmental Permitting Regulations (EPR) with associated solvent treatment and carbon dioxide compression and storage (referred to as post combustion carbon capture or PCC).

How this document is structured

Contents:

Glossary of acronyms used in this document

(Please note that this glossary is standard for our decision documents and therefore not all these acronyms are necessarily used in this document.)

APC	Air Pollution Control
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
AW	Ancient Woodland
BAT	Best Available Technique(s)
BAT-AEL	BAT Associated Emission Level
BAT AEEL	BAT Associated Energy Efficiency Level
BAT C	BAT conclusions
BREF	Best Available Techniques (BAT) Reference Documents for Waste Incineration
BS	British Standard
CC	Carbon capture
CCS	Carbon capture and storage
CEM	Continuous emissions monitor
CHP	Combined heat and power
CO_2	Carbon dioxide
CROW	Countryside and rights of way Act 2000
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DCC	Direct contact cooler
DD	Decision document
DEA	Diethanolamine
Defra	Department of the Environment, Food and Rural Affairs
DMA	Dimethlyamine
EAL	Environmental assessment level
EfW	Energy from waste
ELV	Emission limit value
EMS	Environmental Management System
EP	Environmental permit
EPR	Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154) as amended

EQS	Environmental Quality Standard
ES	Environmental standard
EU	European Directive
FEED	Front end engineering design
FSA	Food Standards Agency
GET	Guidance on emerging techniques
HCl	Hydrogen chloride
HSE	Health and Safety Executive
IED	Industrial Emissions Directive (2010/75/EU)
LCP	Large combustion plant
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MCERTS	Monitoring Certification Scheme
MEA	Monoethanolamine
MWe	Mega watts of electrical power
NDELA	n-nitrosodiethanolamine
NDMA	N-nitrosdimethylamine
NH_3	Ammonia
NO	Nitrogen oxide
NOx	Oxides of nitrogen (NO plus NO_2 expressed as NO_2)
NO_2	Nitrogen dioxide
OTNOC	Other than normal operating conditions
PAH	Poly aromatic hydrocarbon
PC	Process Contribution
PCB	Polychlorobiphenyl
PCC	Post-combustion carbon capture
PEC	Predicted Environmental Concentration
PPS	Public participation statement
RFI	Request for information
RGN	Regulatory Guidance Note
SAC	Special Area of Conservation
SCR	Selective catalytic reduction

SHPI(s)	Site(s) of High Public Interest
SNCR	Selective non-catalytic reduction
SO_3	Sulphur trioxide
SOx	Oxides of sulphur
SPA(s)	Special Protection Area(s)
SSSI(s)	Site(s) of Special Scientific Interest
SWMA	Specified waste management activity
TGN	Technical guidance note
TOC	Total Organic Carbon
UK	United Kingdom
UKAS	UK Accreditation Service
VOC	Volatile organic compound
WFD	Waste Framework Directive (2008/98/EC)

Links to guidance documents

The table below provides links to the key guidance documents referred to in this document. The links were correct at the time of producing this document.

Name of guidance document	Link
RGN 6: Determinations involving sites of high public interest	RGN 6
CHP Ready Guidance for Combustion and Energy from Waste Power Plants	CHP ready
Post-combustion carbon dioxide capture: emerging techniques	Emerging techniques
Risk assessments for your environmental permit	Risk assessments

1 Our draft decision

We are minded to issue the Permit to the Applicant. This will allow it to operate the part of the Installation, subject to the conditions in the Permit.

We consider that, in reaching that decision, we have taken into account all relevant considerations and legal requirements and that the permit will ensure that a high level of protection is provided for the environment and human health.

This Application is to operate part of an installation which is subject principally to the Industrial Emissions Directive (IED).

The draft Permit contains many conditions taken from our standard Environmental Permit template including the relevant Annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations (EPR) and other relevant legislation. This document does not therefore include an explanation for these standard conditions. Where they are included in the Permit, we have considered the Application and accepted that the details provided are sufficient and satisfactory to make use of the standard condition acceptable and appropriate. This document does, however, provide an explanation of our use of "tailor-made" or installation-specific conditions, or where our Permit template provides two or more options, an explanation of the reason(s) for choosing the option that has been specified.

2 How we reached our draft decision

2.1 Receipt of Application

The Application was duly made on 02/02/2024. This means we considered it was in the correct form and contained sufficient information for us to begin our determination but not that it necessarily contained all the information we would need to complete that determination: see section 2.3 below.

The Applicant made no claim for commercial confidentiality. We have not received any information in relation to the Application that appears to be confidential in relation to any party.

2.2 Consultation on the Application

We carried out consultation on the Application in accordance with the EPR, our statutory Public Participation Statement (PPS) and our own internal guidance RGN 6 for Determinations involving Sites of High Public Interest. RGN 6 was withdrawn as external guidance, but it is still relevant as Environment Agency internal guidance.

We consider that this process satisfies, and frequently goes beyond, the requirements of the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, which are directly incorporated into the IED, which applies to the Installation and the Application. We have also taken into account our obligations under the Local Democracy, Economic Development and Construction Act 2009 (particularly Section 23). This requires us, where we consider it appropriate, to take such steps as we consider appropriate to secure the involvement of representatives of interested persons in the exercise of our functions, by providing them with information, consulting them or involving them in any other way. In this case, we consider that our consultation already satisfies the requirements of the 2009 Act.

We advertised the Application by a notice placed on our website, which contained all the information required by the IED, including telling people where and when they could see a copy of the Application. We also placed an advertisement in the Liverpool Echo and Runcorn & Widnes Weekly News on 29/02/2024 that contained the same information.

We made a copy of the Application and all other documents relevant to our determination available to view on our Public Register. Anyone wishing to see these documents could do so and arrange for copies to be made.

We sent copies of the Application to the following bodies, which includes those with whom we have “Working Together Agreements”:

- Local Authority- Environmental Protection Department
- Fire & Rescue (Merseyside)
- UK Health Security Agency
- Health and Safety Executive
- Food Standards Agency

These are bodies whose expertise, democratic accountability and/or local knowledge make it appropriate for us to seek their views directly. Note under our Working Together Agreement with Natural England, we only inform Natural England of the results of our assessment of the impact of the installation on designated Habitats sites.

Written comments were accepted beyond the formal consultation period. Further details along with a summary of consultation comments and our response to the representations we received can be found in Annex 4. We have taken all relevant representations into consideration in reaching our draft determination.

2.3 Requests for Further Information

Although we were able to consider the Application duly made, we did in fact need more information in order to determine it and issued information notices, as shown in table 1 below, on 17/04/2024, 30/05/2024 and 21/11/2024 and requests for information (RFI) on 05/08/2024. Copies of the information

notices were placed on our public register together with the responses on receipt.

Table 1 Request and response dates for information notices and requests		
Request date	Response date	Summary of information
17/04/2024 Notice No1	17/05/2024	Information on multi-operator installation, air quality assessment, CO_2 management, solvent selection, effluent treatment, storage of chemicals, energy efficiency and site plans.
30/05/2024 Notice No2	20/06/2024 25/07/2024 09/08/2024	Information on CO_2 venting assessment. Information on noise impact assessment. Revised noise impact assessment.
05/08/2024 RFI	16/08/2024 02/09/2024	Information on CO2 conditioning and updated environmental risk assessment. Clarification on effluent treatment.
21/11/2024 Notice No3	10/12/2024	Revised noise impact assessment.

In addition to our information notices, we received additional information during the determination from the Applicant on 10/06/2024: discharge modelling report. We made a copy of this information available to the public in the same way as the responses to our information notices.

2.4 Consultation on our draft decision

Having carefully considered the Application and all other relevant information, we are now putting our draft decision before the public and other interested parties in the form of a draft Permit, together with this explanatory document. As a result of this stage in the process, the public has been provided with all the information that is relevant to our determination, including the original Application and additional information obtained subsequently, and we have given the public two separate opportunities (including this one) to comment on the Application and its determination. Once again, we will consider all relevant representations we receive in response to this final consultation and will amend this explanatory document as appropriate to explain how we have done this, when we publish our final decision.

3 The legal framework

The Permit will be granted, if appropriate, under Regulation 13 of the EPR. The Environmental Permitting regime is a legal vehicle which delivers most of

the relevant legal requirements for activities falling within its scope. In particular, the regulated facility is:

- part of an *installation* with Post-combustion Carbon Capture (PCC) for geological storage as described by the IED; and
- subject to aspects of other relevant legislation which also have to be addressed.

We address some of the major legal requirements directly, where relevant, in the body of this document. Other requirements are covered in section 7 towards the end of this document.

We consider that, if we issue the Permit, it will ensure that the operation of the Installation complies with all relevant legal requirements and that a high level of protection will be delivered for the environment and human health.

We explain how we have addressed specific statutory requirements more fully in the rest of this document.

4 The Installation

The Installation is a multi-operator installation comprising an incineration plant under section 5.1 A(1) of schedule 1 of EPR operated by Viridor Energy Limited under permit number EPR/XP3005LB and a CC plant as described below subject to this Application.

4.1 Description of the CC plant and the proposed activities

4.1.1 The permitted activities

The CC plant is subject to the EPR because it carries out an activity listed in Part 1 of Schedule 1 to the EPR:

- Section 6.10 A(1)(a) - Capture of carbon dioxide streams from an installation for the purposes of geological storage pursuant to Directive 2009/31/EC of the European Parliament and of the Council on the geological storage of carbon dioxide

An installation may also comprise “directly associated activities”, which at the CC plant includes:

- Raw materials storage for CC plant
- Waste amine solvent storage
- Water treatment plant
- Back pressure turbine
- CO_2 compression

Together, these listed activities and directly associated activities comprise the CC plant. The CC plant and the incineration plant comprise the Installation.

4.1.2 The Site

The CC plant will be installed on additional land to the west/north-west of the incineration plant. The Applicant submitted a plan which we consider is satisfactory, showing the site of the Installation and its extent and the part of the Installation to which the Application relates. A plan is included in Schedule 7 to the Permit, and the Operator is required to carry on the permitted activities within the site boundary.

Further information on the site is addressed below at 4.2.

4.1.3 What the CC plant does

The purpose of the Application is to permit the CC plant. The associated changes to the incineration plant will be varied under application EPR/XP3005LB/V006, therefore, the operation of the incineration plant will not be covered further in this section. We are not consulting on the changes made to EPR/XP3005LB as these are minor and there are no substantial changes to the operation of the incineration plant.

The activities taking place at the CC plant comprise:

- Carbon capture plant
- Carbon capture plant flue gas abatement system with water wash
- Back pressure turbine for generating low pressure steam for the CC plant
- Compression, de-oxygenation and dehydration systems for CO_2 conditioning before transfer off site
- Water treatment plant consisting of ultra-filtration and carbon filter absorption.

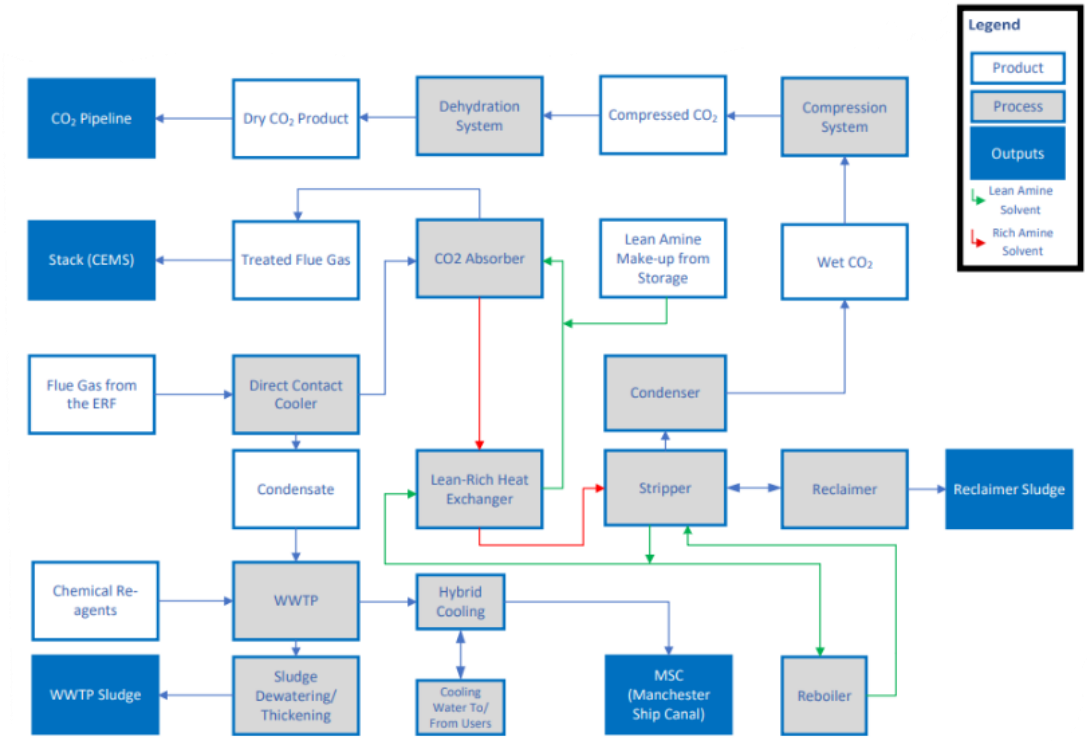
4.1.3.1 Operation of the CC plant

(i) Overview

The process of reducing carbon dioxide emissions from incineration plant can be summarised in three main steps which are:

1. Separation of CO_2 from the flue gas stream of the incineration plant;
2. Compression, conditioning, and transportation of the CO_2 (via pipeline or shipping); and
3. Use of the captured CO_2 as a resource for other industries or storage within suitable geological formations (saline aquifers, depleted oil and gas reservoirs).

Step 1 and the compression and conditioning of the CO_2 from Step 2 are relevant to the determination of the application and are summarised in the process overview below:



The treated flue gases will be ducted from all four lines of the incineration plant and collected in a manifold prior to treatment in the CC plant. The flue gases will be monitored for compliance with the ELVs in the exisiting incineration plant permit and the Waste Incineration BREF before being passed to the CC plant.

The CC plant will require heat, in the form of steam, for CO_2 stripping, amine regeneration and flue gas reheating. Power will also be required. The heat and power for the operation of the CC plant will primarily be supplied from lines 3 and 4 of the incineration plant.

The CC plant will utilise heat from the incineration plant for CO_2 stripping, amine regeneration and flue gas re-heating. Steam produced from the incineration plant will be extracted for use in the CC plant, expanded to the correct pressure using a back pressure turbine, which will generate sufficient power for the CC plant.

The CC plant is designed so that the flue gases from the incineration plant can either be treated within the CC plant or released to atmosphere through the existing stack without the capture of CO_2.

(ii) <u>Flue gas cooling</u>

Flue gases received from the incineration plant will be cooled in a Direct Contact Cooler (DCC) unit. The DCC will include sodium hydroxide as a caustic scrubber to neutralise acid gases condensed from the flue gas.

The condensate from the DCC will be routed to the wastewater treatment plant and treated before being used as make-up water for the hybrid cooling towers.

(iii) CO_2 absorption

The cooled flue gas (approximately 35^{O}C) is ducted to a packed bed absorber column. Cooled flue gases enter the base of the column and flow counter current to the lean amine solution (amine without CO_2). The sections of packing within the column increase the internal area and therefore the rate of reaction. The CO_2 reacts with the lean amine in an exothermic reaction.

Following the packing section, the flue gas enters the water wash. The water wash will abate emissions of amines and their degradation products; nitrosamines and nitramines. The absorber tower will also be equipped with a demister system to mitigate against the formation of mist droplets and solvent vapour. The temperature of the flue gas leaving the absorber column will be approximately 60^{O}C.

(iv) Amine regeneration

The rich amine solution (amine with CO_2) is drained from the absorber and pumped to the stripper column where the captured CO_2 is released. Heat from the reboiler increases the temperature of the rich amine solution releasing the captured CO_2 and producing a hot lean amine solution which is recirculated back to the absorber tower. The CO_2 and amine vapour which reaches the top of the tower will be cooled in a condenser before being conditioned.

The amine solvent degrades as it is recycled due to the presence of other gaseous species such as sulphur dioxide and nitrous oxides. These species react with the amines, and form degradation products, which can be heat stable salts, non-volatile organic compounds, or suspended solids. These products are corrosive and reduce the effectiveness of the solvent for capturing CO_2. Reclaiming is required to remove these products and restore the effectiveness of the amine solution. A slip stream of the amine is dosed with sodium hydroxide to remove acids. The amine is then passed to a reboiler where it is heated until the liquid has ‘boiled off’ and the vapour is returned to the stripper. A residual sludge will remain which contains water, amine, thermal degradation products and heat stable salts.

(v) CO_2 conditioning

Before compression, the CO_2 must be conditioned to meet the pipeline requirements. The gas stream will be deoxygenated by injecting hydrogen into the gas stream to react with oxygen and produce water. The reaction is

catalysed with a solid palladium catalyst. The wet CO_2 stream is then dried using a pressure/temperature swing adsorption process using a desiccant to trap water. The recovered water will be recycled within the CC process.

(vi) CO_2 compression

Compression of CO_2 is necessary to meet the requirements of the pipeline. Several stages of compression with intercoolers between will be used although this is subject to final design. A pre-operational condition, PO13, requires the Operator to confirm the final, detailed design of the compressor stage.

(vii) CO_2 transport off-site

The CC plant is designed to compress and treat CO_2 for injection into the HyNet CO_2 pipeline for storage offshore in the Liverpool Bay sub-sea depleted oil and gas reservoirs.

If the quality of the CO_2 does not meet pipeline specifications, it cannot be exported and must be vented to atmosphere. The CO_2 will be vented via the CO_2 vent stack.

(viii) Raw material and reagent use

The CC plant will require raw materials and reagents which are currently not stored or utilised by the incineration plant. These additional materials/reagents are:

1. Amine solvent, used for capture of CO_2.
2. Sodium hydroxide, used for acid gas abatement and in the reclaimer.
3. Sulphuric acid used in the water treatment process.
4. Water treatment chemicals used in the hybrid cooling towers as corrosion inhibitors, scale inhibitors, dispersants and biocides.
5. Hydrogen used for CO_2 conditioning.

(ix) Water treatment plant

The water treatment plant will treat the condensate generated by the DCC for re-use within the hybrid cooling system. Any process effluents generated by the CC facility which could potentially be contaminated with amines will be recycled within the process, not routed to the wastewater treatment plant. The design of the wastewater treatment plant is subject to final design. Pre-operational condition, PO12, requires the operator to confirm final, detailed design of the plant.

(x) Energy use

The CC plant will draw heat from the incineration plant for use in the CC process. High pressure steam will be bled from the incineration plant and expanded through a back pressure turbine to the pressure required for the reboiler. The back pressure turbine will generate electrical power from expanding this steam.

The CC plant will have the following demands for heat and power:

- steam at 4 bar(a) and 144^{O}C
- 14.1MW$_{e}$ of electrical power

(xi) Abnormal operation

Under normal operation the flue gases from the incineration plant will be discharged to the CC facility. Where the CC plant is not available or during periods of abnormal operation of the incineration plan, the flue gases will be emitted through the existing incineration stack. Periods of abnormal operation and unavailability of the CC plant are not considered further in this decision document as emissions have already been assessed in permit EPR/XP3005LB.

4.2 The site and its protection

4.2.1 Site setting, layout and history

The site boundary of the Installation has been extended to include additional land to the west/north-west of the incineration plant. The CC plant will be located on this land, adjacent to the incineration plant. The Installation is located within the INEOS industrial works at Runcorn, Cheshire. The overall INEOS site covers an area of approximately 10 hectares.

The CC plant will be located on the site of a former power plant.

Other surrounding land uses include operational salt works and Weston Docks to the north and west, a caustic tank farm directly to the north and residential properties to the south. There are recreational grounds to the east of the site across Picow Farm Road, which forms the eastern boundary of the site with residential properties beyond this to the east and north-east.

4.2.2 Proposed site design: potentially polluting substances and prevention measures

The detailed design of the CC plant has not yet been finalised, but the chemical storage and handling area will be designed in accordance with our pollution prevention guidance titled ‘Pollution prevention for businesses’. The following have been considered:

(i) Storage and transfer of chemicals

All chemicals will be stored in appropriate storage facilities with suitable secondary containment measures on areas of hardstanding in dedicated chemical handling areas.

Tanker offloading of chemicals will take place within the dedicated chemical storage and handling areas via standard hose connection. Unloading activities will be supervised by suitably competent personnel with knowledge and understanding of Viridor's procedures for chemical storage and handling. Adequate quantities of spillage absorbent materials will be available and accessible where chemicals are stored or unloaded.

(ii) Bunds

Bunds will have a minimum capacity of 110% of the largest container or 25% of the total stored volume, whichever is greater. The bunds will be impermeable and resistant to the chemicals they contain. They will be maintained regularly to prevent leaks.

(iii) Drainage

Contained drainage will be in place within the chemical storage and handling area. Uncontaminated surface water run-off will be collected in dedicated surface water drainage systems. A penstock valve will be installed to enable the surface water system to be isolated in the event of an incident. In the event of a fire the drainage systems will contain any firefighting water and additional storage will be available from the site kerbing.

Under Article 22(2) of the IED the Applicant is required to provide a baseline report containing at least the information set out in paragraphs (a) and (b) of the Article before starting operation.

The Applicant has not submitted a baseline report. We have therefore set a pre-operational condition, PO9, requiring the Operator to provide this information prior to the commencement of operations.

The baseline report is an important reference document in the assessment of contamination that might arise during the operational lifetime of the Installation and at cessation of activities at the Installation.

4.2.3 Closure and decommissioning

Pre-operational condition PO1 requires the Operator to have an Environmental Management System in place before the CC plant is operational, and this will include a site closure plan.

At the definitive cessation of activities, the Operator has to satisfy us that the necessary measures have been taken so that the site ceases to pose a risk to soil or groundwater, taking into accounts both the baseline conditions and the site's current or approved future use. To do this, the Operator will apply to us

for surrender of the permit, which we will not grant unless and until we are satisfied that these requirements have been met.

4.3 Operation of the CC plant – general issues

4.3.1 Administrative issues

This is a multi-operator Installation. See preliminary information for details of the operators of this Installation.

We are satisfied that the Applicant is the person who will have control over the operation of the CC plant after the granting of the Permit; and that the Applicant will be able to operate the Installation so as to comply with the conditions included in the Permit.

4.3.2 Management

The Applicant has stated in the Application that they will implement an Environmental Management System (EMS). A pre-operational condition (PO1) is included in the Permit requiring the Operator to provide a summary of the EMS prior to commissioning of the plant and to make available for inspection all EMS documentation.

We are satisfied that appropriate management systems and management structures will be in place for the CC plant, and that sufficient resources are available to the Operator to ensure compliance with all the Permit conditions.

4.3.3 Site security

Having considered the information submitted in the Application, we are satisfied that appropriate infrastructure and procedures will be in place to ensure that the site remains secure.

4.3.4 Accident management

The Applicant has not submitted an Accident Management Plan. However, having considered the other information submitted in the Application, we are satisfied that appropriate measures will be in place to ensure that accidents that may cause pollution are prevented but that, if they should occur, their consequences are minimised. An Accident Management Plan will form part of the Environmental Management System and must be in place prior to commissioning as required by a pre-operational condition (PO1).

4.3.5 Off-site conditions

We do not consider that any off-site conditions are necessary.

4.3.6 Operating techniques

We have specified that the Applicant must operate the CC plant in accordance with the following documents contained in the Application:

Table S1.2 Operating techniques		
Description	**Parts**	**Justification**
Application EPR/QP3724SE/A001	Application documents including: Application forms B2 and B3 and referenced supporting document; Supporting Information, reference S3530-0320-0002JRS and dated 13/12/2023.	These documents contain key operating techniques that will ensure environmental risk is managed on site.
Response to first Schedule 5 Notice dated 17/04/2024	Response to questions 1, 5, 7, 12 and 15 Appendix A- Responsibilities Matrix Appendix D- Plans and drawings	
Additional information	Response to questions on CO_2 conditioning	

The details set out above describe the techniques that will be used for the operation of the CC plant that have been assessed by us as being in accordance with our emerging techniques guidance; they form part of the Permit through Permit condition 2.3.1 and Table S1.2 in the Permit Schedules.

We have also specified the following limits and controls on the use of raw materials and fuels:

Raw Material or Fuel	**Specifications**	**Justification**
Monoethanolamine (MEA)	Diethanolamine (DEA) not exceeding 0.2% content (unless otherwise agreed with the Environment Agency).	DEA is a known secondary amine contaminant in the production of MEA. Due to the higher likelihood of degradation product formation from secondary amines in this process we have set a specification for the maximum amount of DEA present that we understand is achievable so that emissions from the CC plant are within the limits used in the impact assessment.

4.3.7 Energy efficiency

(i) Consideration of energy efficiency

We have considered the issue of energy efficiency and the use of energy within, and generated by, the CC plant which are normal aspects of all EPR permit determinations.

We are satisfied that the Applicant has considered the use of energy within the CC process and that they have taken appropriate measures to use energy as efficiently as possible.

(ii) Choice of Cooling System for CC plant

Cooling water will be required to cool the incoming flue gas, the lean amine, the water wash flow water and CO_2 product. Hybrid coolers will be used in conjunction with dry cooling. Water that is recovered from the direct contact cooler as condensate will be re-used within the evaporative cooling system.

We agree that the Applicant's choice of cooling systems for the CC plant is BAT in accordance with the standards set out in PCC emerging techniques guidance.

(iii) Permit conditions concerning energy efficiency

The Operator is required to report energy usage and energy generated under condition 4.2 and Schedule 4 of the Permit. The following parameters are required to be reported: total energy usage and total (thermal and electrical) energy use per tonne of carbon dioxide captured.

There are no site-specific considerations that require the imposition of standards beyond the emerging techniques guidance, and so we accept that the Applicant's proposals are BAT in accordance with the guidance.

4.3.8 Efficient use of raw materials

Having considered the information submitted in the Application, we are satisfied that the appropriate measures will be in place to ensure that the Operator will make efficient use of raw materials and water.

4.3.9 Avoidance, recovery or disposal with minimal environmental impact of wastes produced by the permitted activities

This requirement addresses wastes produced by the CC plant and does not apply to the waste being treated by the incineration plant. The principal waste streams produced by the CC plant are:

- residual sludge from the amine solvent reclaimer
- waste water treatment plant sludge

The sludge from the reclaimer and waste water treatment plant will be taken off site for disposal.

Having considered the information submitted in the Application, we are satisfied that the waste hierarchy referred to in Article 4 of the Waste Framework Directive (WFD) will be applied to the generation of waste and that any waste generated will be treated in accordance with that Article.

We are satisfied that waste from the CC plant that cannot be recovered will be disposed of using a method that minimises any impact on the environment. Standard condition 1.4.1 will ensure that this position is maintained.

5 The CC plant's environmental impact

Regulated activities can present different types of risk to the environment, these include odour, noise and vibration; accidents, fugitive emissions to air and water; as well as point source releases to air, discharges to ground or groundwater and generation of waste and other environmental impacts. Consideration may also have to be given to the effect of emissions being subsequently deposited onto land (where there are ecological receptors). All these factors are discussed in this and other sections of this document.

For carbon capture using amine solvents, the principal emissions are those:

- to air
- to water
- from noise; and
- from venting from CO_2 compression.

The next sections of this document explain how we have approached the critical issue of assessing the likely impact of the emissions to air from the carbon capture activity on human health and the environment and what measures we are requiring to ensure a high level of protection.

5.1 Assessment Methodology

5.1.1 Application of Environment Agency guidance 'risk assessments for your environmental permit'

A methodology for risk assessment of point source emissions to air, which we use to assess the risk of applications we receive for permits, is set out in our guidance 'Air emissions risk assessment for your environmental permit' and has the following steps:

- Describe emissions and receptors
- Calculate process contributions
- Screen out insignificant emissions that do not warrant further investigation
- Decide if detailed air modelling is needed

- Assess emissions against relevant standards
- Summarise the effects of emissions

The methodology uses a concept of “process contribution (PC)”, which is the estimated concentration of emitted substances after dispersion into the receiving environmental media at the point where the magnitude of the concentration is greatest. The methodology provides a simple method of calculating PC primarily for screening purposes and for estimating process contributions where environmental consequences are relatively low. It is based on using dispersion factors. These factors assume worst case dispersion conditions with no allowance made for thermal or momentum plume rise and so the process contributions calculated are likely to be an overestimate of the actual maximum concentrations. More accurate calculation of process contributions can be achieved by mathematical dispersion models, which take into account relevant parameters of the release and surrounding conditions, including local meteorology – these techniques are expensive but normally lead to a lower prediction of PC.

5.1.2 Use of Air Dispersion Modelling

We required the Applicant to submit a full air dispersion model as part of their Application for the key pollutants from the PCC. Air dispersion modelling enables the process contribution to be predicted at any environmental receptor that might be impacted by the plant.

Once short-term and long-term PCs have been calculated in this way, they are compared with Environmental Standards (ES) for air emissions. ES are described in our web guide ‘Air emissions risk assessment for your environmental permit’.

Our web guide sets out the relevant ES as:

- Air Quality Standards Regulations 2010 Limit Values
- Air Quality Standards Regulations 2010 Target Values
- UK Air Quality Strategy Objectives
- Environmental Assessment Levels

Where a Limit Value exists, the relevant standard is the Limit Value. Where a Limit Value does not exist, target values, UK Air Quality Strategy (AQS) Objectives or Environmental Assessment Levels (EALs) are used. Our web guide sets out EALs which have been derived to provide a similar level of protection to human health and the environment as the limit values, target values and AQS objectives. In a very small number of cases, e.g. for emissions of lead, the AQS objective is more stringent that the Limit Value. In such cases, we use the AQS objective for our assessment.

Target values, AQS objectives and EALs do not have the same legal status as Limit Values, and there is no explicit requirement to impose stricter conditions

than BAT in order to comply with them. However, they are a standard for harm and any significant contribution to a breach is likely to be unacceptable.

PCs are screened out as **Insignificant** if:

- the **long-term** PC is less than **1%** of the relevant ES; and
- the **short-term** PC is less than **10%** of the relevant ES.

The **long term** 1% PC insignificance threshold is based on the judgements that:

- It is unlikely that an emission at this level will make a significant contribution to air quality;
- The threshold provides a substantial safety margin to protect human health and the environment.

The **short term** 10% PC insignificance threshold is based on the judgements that:

- spatial and temporal conditions mean that short term process contributions are transient and limited in comparison with long term process contributions;
- the threshold provides a substantial safety margin to protect human health and the environment.

Where an emission is screened out in this way, we would normally consider the Applicant's proposals for the prevention and control of the emission to be BAT. That is because if the impact of the emission is already insignificant, it follows that any further reduction in this emission will also be insignificant.

However, where an emission cannot be screened out as insignificant, it does not mean it will necessarily be significant.

For those pollutants which do not screen out as insignificant, we determine whether exceedences of the relevant ES are likely. This is done through detailed audit and review of the Applicant's air dispersion modelling taking background concentrations and modelling uncertainties into account. Where an exceedance of the relevant ES is identified, we may require the applicant to go beyond what would normally be considered BAT for the Installation, where BAT standards are available, or we may refuse the application if the applicant is unable to provide suitable proposals. Whether or not exceedences are considered likely, the application is subject to the requirement to operate in accordance with BAT or other emerging techniques guidance.

This is not the end of the risk assessment, because we also take into account local factors (for example, particularly sensitive receptors nearby such as a SSSIs, SACs or SPAs). These additional factors may also lead us to include more stringent conditions than BAT.

If, as a result of reviewing the risk assessment and taking account of any additional techniques that could be applied to limit emissions, we consider that emissions **would cause significant pollution**, we would refuse the Application.

5.2 Assessment of Impact on Air Quality

The Applicant's assessment of the impact of air quality is set out in Annex D: Dispersion Modelling Assessment of the Application. The assessment comprises:

- Dispersion modelling of emissions to air from the operation of the incineration plant, the "Permitted Facility".
- Dispersion modelling of emissions to air from the operation of the installation (the incineration plant and the CC plant), the "Proposed Facility".
- A study of the impact of emissions on nearby protected conservation areas.
- A study of the potential impact at ground level and at elevated working platforms from CO_2 venting.

The dispersion modelling and assessment of emissions to air from the already permitted incinerator stack have not been assessed as part of this Application. Where they will be passed to the CC plant, the following pollutants from the incineration plant were included in the dispersion modelling assessment of the impact from the CC plant:

- Oxides of nitrogen
- Sulphur dioxide
- Carbon monoxide
- Particulate matter
- Hydrogen chloride
- Total organic carbon
- Hydrogen fluoride
- Ammonia
- Cadmium and thallium
- Mercury
- Antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium
- PAHs
- Dioxins and furans
- PCBs

The mass release rate of emissions of pollutants emitted from the incineration plant is assumed to be unchanged in passing through to the CC plant. The stack parameters and location of the CC stack are different to the existing permitted facility. As this affects dispersion, the impacts of these pollutants were assessed. The Applicant concludes that for these pollutants the PCs are either below 1% and 10% of the ES or the PECs are below the ES. We agree with the Applicant's conclusion. No further emissions controls are required with the exception of Ammonia which is considered further in sections 5.2.2 and 5.3.2. The pollutants associated with the carbon capture process are considered further in this section.

The hybrid cooling towers will emit small quantities of regulated pollutants from emission points A9 and A10 which are stacks on the compressor house and hybrid cooler building. The Applicant has assumed that each cooler unit operates continuously at full load which is a conservative assumption. The maximum PC from the hybrid coolers is below 1% of the long term and 10% of the short term ES for the following pollutants:

- Ammonia
- Mercury
- Cadmium
- Antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium

For VOCs (as benzene), the PC exceeds 1% of the long term ES however, taking into account the background and the proposed impact from the CC facility, the PEC would be below 70% of the long term ES and therefore not significant.

To assess the impact from the CC plant's absorber stack, A7, the emissions associated with the CC plant were modelled i.e. amine solvent and its degradation products.

This section of the decision document deals primarily with the dispersion modelling of emissions to air from the CC plant absorber stack and its impact on local air quality. The impact on conservation sites is considered in section 5.3. The impact from CO_2 venting is considered in section 5.4.

The Applicant has assessed the CC plant's potential emissions to air against the relevant air quality standards, and the potential impact upon local conservation and habitat sites and human health. These assessments predict the potential effects on local air quality from the CC plant's stack emissions using the air dispersion model software ADMS 6.0 dispersion model, which is a commonly used computer model for regulatory dispersion modelling. The model used 5 years of meteorological data collected from the weather station at Liverpool Airport meteorological recording station between 2018 and 2022. Liverpool Airport is located approximately 6km to the west of the installation. We consider this meteorological site reasonably representative. The effect of the terrain surrounding the site upon plume dispersion was considered in the dispersion modelling.

The air impact assessments, and the dispersion modelling upon which they were based, employed the following assumptions:

- First, they assumed that all 4 lines of the incineration plant operate continuously at the permitted ELVs

- Second, for emissions from the CC plant associated with the carbon capture process, the following substances were modelled:
    - MEA

- Nitrosamines from MEA
- Nitramines from MEA
- Diethanolamine (DEA)
- Nitrosamines from DEA
- Nitramines from DEA
- Dimethylamine (DMA)
- Nitrosamines from DMA
- Nitramines from DMA
- Aldehydes (as formaldehyde)
- CO_2 from the vent stack

- Third, that there is no additional abatement of emissions through the CC plant.

The following assumptions were made for the amine emissions from the CC plant absorber stack:

- Emissions of DEA and DMA in total assumed to be 5% of the MEA emissions with a 50/50 split of each.
- No nitrosamines from MEA emitted.
- Total nitramines assumed to be 0.1 µg/Nm^3 apportioned as per the amine concentration – i.e. 95% from MEA, with 2.5% from DEA and DMA.
- Total nitrosamines assumed to be 0.1 µg/m^3 apportioned equally between nitrosamines formed from DEA and DMA.
- It is assumed that the mass release rate of pollutants from the incineration plant at the ELVs is released via the CC plant with no allowance for any additional abatement of emissions which would occur within the CC plant.

We are in agreement with this approach. The assumptions underpinning the model have been checked and are a reasonable worst-case.

The Applicant considered background pollutant concentrations from diffusion tubes and automatic monitoring data presented in the Halton Borough Council Annual Status Report, air quality networks spread across the UK and Defra background maps. We consider the consultant's chosen background values to be reasonably representative.

As well as predicting the maximum ground level concentration of the pollutants within the modelling domain, the Applicant has modelled several discrete receptor locations to represent human and ecological exposure.

The Applicant's use of the dispersion models, selection of input data, use of background data and the assumptions made, have been reviewed by our modelling specialists to establish the robustness of the Applicant's air impact assessment. The output from the model has then been used to inform further assessment of human health impacts and impact on protected conservation areas. Our audit takes account of modelling uncertainties. We make reasonable worst-case assumptions and use the uncertainties (minimum 140%) in analysing the likelihood of exceeding any particular standard.

We have audited the air quality and human health impact assessment and, although we do not necessarily agree with the Applicant's exact numerical predictions, we agree with the conclusions, provided that the source terms from the proposed facility are reasonably representative.

The Applicant's modelling predictions are summarised in the following sections.

5.2.1 Assessment of Air Dispersion Modelling Outputs

The Applicant's modelling predicted peak ground level exposure to pollutants in ambient air and at discreet receptors. The table below show their predicted ground level concentrations at the most impacted receptor.

As part of our checks, we carry out sensitivity analysis of the data provided and conduct our own check modelling to ensure that the Applicant's modelling predictions are reliable.

Whilst we have used the Applicant's modelling predictions in the table below, we have made our own simple verification calculation of the percentage PC and predicted environmental concentration (PEC). These are the numbers shown in the tables below and so may be very slightly different to those shown in the Application. Any such minor discrepancies do not materially impact on our conclusions.

Pollutant	ES		Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	µg/m^3	Reference period	µg/m^3	µg/m^3	% of EAL	µg/m^3	% of EAL
Ammonia (NH_3)	2,500	1 hour mean	9.4	7.06	0.28%	16.46	0.66%
	180	Annual mean	4.7	0.11	0.06%	4.81	2.67%
Aldehydes (as formaldehyde)	100	30 minute mean	4.74	2.17	2.17%	6.91	6.91%
	5	Annual mean	2.37	0.03	0.6%	2.40	48%
Amines (as MEA)	400	1 hour mean	0	4.06	1.02%	4.06	1.02%
	100	24 hour mean	0	1.07	1.07%	1.07	1.07%
Total nitrosamines (as NDMA)	0.0002	Annual mean	0	0.0000025[(1)]	1.25%	0.0000025	1.25%

Total nitrosamines + nitramines (as NDMA)	**0.0002**	**Annual mean**	**0**	**0.00000919[(1)]**	**4.60%**	**0.00000919**	**4.60%**
[(1)] PCs include direct and indirect emissions							

(i) Screening out emissions which are insignificant

From the table above the following emissions can be screened out as insignificant in that the PC is < 1% of the long term ES and <10% of the short term ES. These are:

- Ammonia
- Aldehydes (as formaldehyde)

Therefore, we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT in accordance with PCC emerging techniques guidance subject to the detailed audit referred to below.

(ii) Emissions unlikely to give rise to significant pollution

Also, from the table above the following emissions (which were not screened out as insignificant) have been assessed as being unlikely to give rise to significant pollution in that the PEC is significantly less than 100% (taking expected modelling uncertainties into account) of both the long term and short term ES.

- Amines (as MEA)
- Total nitrosamines (as NDMA)
- Total nitrosamines and nitramines (as NDMA)

For these emissions, we have carefully scrutinised the Applicant's proposals to ensure that they are applying our emerging techniques guidance to prevent and minimise emissions of these substances. This is reported in section 6 of this document.

(iii) Emissions requiring further assessment

All emissions either screen out as insignificant or, where they do not screen out as insignificant, are considered unlikely to give rise to significant pollution. Therefore, we are satisfied that there are no emissions requiring further assessment.

5.2.2 Consideration of key pollutants

(i) Ammonia (NH_3)

The ammonia emission is based on a release concentration of 15mg/m^3 from the incineration plant. Ammonia emissions from the carbon capture process were modelled at 0.959g/s.

Ammonia can be screened out as insignificant in that the PC is <1% of the long-term ES and <10% of the short term ES.

(ii) Amines, nitrosamines, nitramines and aldehydes

The above table shows that for Aldehyde (as formaldehyde) emissions, the maximum long-term PC is less than 1% of the ES and the maximum short-term PC is less than 10% of the ES and so can be screened out as insignificant. Therefore, we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT in accordance with the emerging techniques guidance for the CC plant.

The above table shows that for Total amines (as MEA), Total nitrosamines (as NDMA) and Total nitrosamines and nitramines (as NDMA), the maximum long term PC is greater than 1% of the ES and therefore cannot be screened out as insignificant. However, the emission is not expected to result in the ES being exceeded as it is significantly lower than the ES.

The Environment Agency Risk Assessment Guidance includes Environmental Assessment Levels for MEA (a primary amine) and NDMA (a stable nitrosamine). Amines, nitrosamine and nitramines are not routinely monitored in the UK, therefore in the absence of data the Applicant assumed background concentrations to be zero. Applicants are required to consider any other contributions from existing or planned sites, where relevant. The Applicant considered the impacts of the CC plant in-combination with Protos Energy Recovery Facility for total nitrosamines and nitramines and concluded that the risk of ES exceedance and cumulative impact would not be significant. We agree with the Applicant's conclusions.

Directly emitted amines have the potential to react in the atmosphere to form amine degradation products – nitramines and nitrosamines. The nitrosamines and nitramines that form in the atmosphere in this way are referred to as indirect emissions.

The primary amine emitted by the CC plant will be MEA. However, the Applicant has assumed that trace amounts of both DEA and DMA would also be emitted. The nitrosamines formed from primary amines such as MEA are unstable, forming isomers known as imines within a few seconds. Imines are not reactive nor significantly harmful to human health. Therefore, any directly emitted nitrosamines will be formed from secondary amines formed within the absorber tower. The Applicant has assumed that the secondary amines emitted will be equal concentrations of DMA and DEA, and the indirectly emitted nitrosamines will be consequently equal concentrations of NDMA (formed from DMA) and n-nitrosodiethanolamine (NDELA, formed from DEA).

The Applicant used the ADMS 6 amine chemistry module to calculate concentrations of amines, nitramines and nitrosamines based on the release rate of pollutants and a number of user-defined parameters. The Applicant considered that the main model scenario, in which there are direct emissions of amines, nitrosamines and nitramines, and the amine chemistry is enabled, is the most realistic scenario.

The Applicant concludes that, even under the worst-case assumptions, the PEC of total nitrosamines and nitramines would remain well below the EAL and no significant effects would occur.

We are satisfied that the Applicant's amine chemistry model incorporates several conservative assumptions based on the proposed emission parameters.

We have included improvement condition IC6 in the Permit for the Operator to review and compare monitoring data from first year of operation of the CC plant to the air emissions risk assessment submitted with the application.

Whilst all emissions cannot be screened out as insignificant, the Applicant's modelling shows that the CC plant is unlikely to result in a breach of the ES. We agree with the Applicant's conclusions.

(iii) Summary

For the above emissions to air, for those emissions that have not screened out as insignificant, we have carefully scrutinised the Applicant's proposals to ensure that they are applying the emerging techniques guidance to prevent and minimise emissions of these substances. This is reported in section 6 of this document. We consider the Applicant's proposals for preventing and minimising emissions to be BAT in accordance with PCC emerging techniques guidance for the CC plant.

5.2.3 Consideration of Local Factors

(i) Impact on Air Quality Management Areas (AQMAs)

No AQMAs have been declared within an area likely to be affected by emissions from the CC plant.

5.3 Impact on protected conservation areas (SPAs, SACs, Ramsar sites and SSSIs and local nature sites)

5.3.1 Sites Considered

The following Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites are located within 10 km of the CC plant:

- Mersey Estuary SPA and Ramsar

The following Sites of Special Scientific Interest (SSSI) are located within 2 km of the CC plant:

- Mersey Estuary SSSI

The following local nature sites (ancient woodlands (AW), local wildlife sites (LWS) and national and local nature reserves (LNR)) are located within 2 km of the Installation:

- Runcorn Hill (LNR & LWS),
- Pickerings Pasture (LNR & LWS),
- Upper Mersey Estuary (LNR),
- Upper Mersey Estuary Intertidal Areas and Mudflats (LWS).

5.3.2 Habitats Assessment

The Applicant's habitats assessment was reviewed by our technical specialists for air dispersion modelling and assessment and specialists for habitats and conservation who agreed with the assessment's conclusions, that there would be no adverse effect on the interest features of the protected sites. The dispersion model assumed a constant release at the permitted ELVs for both the incineration plant and the CC plant and was therefore conservative. In practice both the incineration plant and the CC plant will be offline for maintenance on occasions, so are unlikely to operate for a full year at full load.

The results of the Applicant's assessment of the impacts of emissions at the habitats sites are shown in the tables below.

Mersey Estuary SPA, Ramsar site and SSSI:

Pollutant	ES / EAL ($\mu g/m^3$)	Back-ground ($\mu g/m^3$)	Process Contribution (PC) ($\mu g/m^3$)	PC as % of ES	Predicted Environmental Concentration (PEC) ($\mu g/m^3$)	PEC as % ES
Direct Impacts[2]						
NO_x Annual	30	16.90	1.21	4.03	18.11	60.37
NO_x Daily Mean[3]	200[1]	39.80	29.23	14.62	69.03	34.6
Ammonia	3[4]	2.6	0.10	3.33	2.7	90
Deposition Impacts[2]						
N Deposition (kg N/ha/yr) Saltmarsh[5]	10-20	21.80	0.42	4.2	22.2	222
N Deposition	10-20	21.80	0.26	2.6	22.06	221

Pollutant	ES / EAL (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % ES
(kg N/ha/yr) Grazing marsh[5]						
Acidification (Keq/ha/yr)	Species not sensitive to effects of acidity					

(1) For detailed assessments where the ozone is below the AOT40 critical level and sulphur dioxide is below the lower critical level of 10 micrograms per cubic metre
(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.
(3) PC at point of maximum ground level impact
(4) Lichens or bryophytes not present
(5) N Deposition includes contributions from amines as well as ammonia and NO_2

The table above shows that at the Mersey Estuary, SPA, Ramsar site, and SSSI PCs are >1% of the NOx, ammonia and nitrogen deposition environmental standards and therefore cannot be screened out as insignificant. For NOx and ammonia, the Applicant's modelling shows that the PC from the CC plant is unlikely to result in a breach of the ES. We agree with this conclusion. For nitrogen deposition the PEC exceeds the ES. This is a result of the high background concentration which, alone, exceeds the ES. The contribution from the CC plant will not be significant.

Ammonia

The impact assumes that ammonia is emitted continuously from the incineration plant resulting in a release rate of 3.506 g/s. Using actual monitoring data, emissions are found to be much lower than the ELV, averaging 0.45 mg/m^3 across four lines in 2021. This is equivalent to a release rate of 0.105 g/s. The maximum anticipated daily ammonia emissions from the CC plant are less than 5 mg/m^3, a release rate of 0.959 g/s and, thus, a total release rate of 1.065 g/s (0.105 g/s + 0.959 g/s). The maximum PCs at the reduced ammonia release rate are shown in the table below. The change in impact from the currently permitted facility to the proposed facility is shown to be less than 2% of the critical load:

Pollutant	Process Contribution (PC) (µg/m³) Permitted facility	PC as % of ES	Process Contribution (PC) (µg/m³ Proposed facility	PC as % ES	Change in PC	Change in PC as % ES
N Deposition (kg N/ha/yr) Saltmarsh	0.03	0.3	0.21	2.1	0.18	1.8
N Deposition (kg N/ha/yr) Grazing marsh	0.026	0.26	0.14	1.4	0.11	1.1

An ELV of 5mg/m^3 has been included in the Permit for ammonia.

Furthermore, none of the qualifying features at the site are sensitive to this compound. Using information available on Natural England's website, it can be established that the pressures associated with this site are not related to air emissions, but rather to land management practices and marine/seaweeds invasive non-native species.

Nitrogen deposition-saltmarsh

The qualifying features do not appear to be adversely affected by the high background levels. The PC addition is 0.42 kg/N/ha/yr representing 4.2% of the critical load. The background concentration is 21.8 kg/N/ha/yr, therefore, there is already significant exceedance. With a PEC of 22.22 kg/N/ha/yr, representing 222% of the critical load, we conclude the PC represents approximately 2% of the background.

Nitrogen deposition- grazing marsh

The PC addition is 0.26 kg/N/ha/yr, 2.6% of the critical load. The background concentration is still exceeding at 21.8 kg/N/ha/yr resulting in a PEC of 22.06 kg/N/ha/yr, 221% of the critical load. The PC represents approximately 1.2% of the background. As above, this habitat does not appear to be adversely affected by the high background levels.

The Applicant concludes that nitrogen impact from air emissions is likely to be very small in comparison to river and tidal input. Our assessment confirmed the occasional inundation and the extent of tidal ingress. Nitrogen loading from tidal water exceeds nitrogen deposition from atmospheric sources.

We have done our own appropriate assessment, and we agree with the Applicant's conclusions that there would be no adverse effect on the integrity of the protected habitat site from the proposed development and it is not likely to damage any of the flora, fauna or geological or physiological features which are of special interest. We have included an ELV for ammonia in the Permit as explained above to ensure this is the case.

See section 7.3.1 for consultation with Natural England.

5.3.3 SSSI Assessment

There are no other Sites of Special Scientific Interest (SSSI) within 2 km of the proposed Installation, besides Mersey Estuary that has already been considered in the section above. The Operator's assessment of the SSSI was reviewed by our technical specialists for air dispersion modelling and specialists for habitats and conservation, who agreed with the assessment's conclusions, that the proposal is not likely to damage the special features of the SSSI.

5.3.4 Assessment of local nature sites

Conservation sites are protected in law by legislation which provides the highest level of protection for SACs and SPAs, and also protection for SSSIs. The Environment Act 1995 provides more generalised protection for flora and fauna rather than for specifically named conservation designations. It is under the Environment Act 1995 that we assess other sites (such as ancient woodlands, local wildlife sites and national and local nature reserves) which prevents us from permitting something that will result in significant pollution; and which offers levels of protection proportionate with other European and national legislation. However, it should not be assumed that because levels of protection are less stringent for these other sites, that they are not of considerable importance. Local sites link and support EU and national nature conservation sites together and hence help to maintain the UK's biodiversity resilience.

For SACs, SPAs, Ramsars and SSSIs we consider the PC and the background levels in making an assessment of impact. In assessing the local nature sites under the Environment Act 1995 we look at the impact from the Installation alone to determine whether it would cause significant pollution. This is a proportionate approach, in line with the levels of protection offered by the conservation legislation to protect these other sites (which are generally more numerous than Natura 2000 or SSSIs) whilst ensuring that we do not restrict development.

Critical levels and loads are set to protect the most vulnerable habitat types. Thresholds change in accordance with the levels of protection afforded by the legislation. Therefore, the thresholds for SAC, SPA and SSSI features are more stringent than those for local nature sites.

We would generally conclude that the Installation is not causing significant pollution at these other sites if the PC is less than the relevant critical level or critical load, provided that the Applicant is using BAT or operating in accordance with the guidance on emerging techniques to control emissions.

The Applicant concluded that the PC does not exceed the critical level or critical load at any of the local nature sites. We are satisfied that the CC plant will not cause significant pollution at any of the other conservation sites. The Applicant is required to prevent, minimise and control emissions in accordance with the emerging techniques guidance.

5.4 Other Emissions

5.4.1 Impact of abnormal venting of carbon dioxide (CO_2)

The release of the captured highly concentrated CO_2 under pressure from the CC plant has the potential to cause harm to human health. It is recognised that venting to atmosphere of concentrated CO_2 may be required during operation of the CC plant. For this reason, the Applicant was required to

provide an assessment of the impact of the vented concentrated CO_2 on harm to health at nearby sensitive receptors.

The Applicant provided an assessment which presented a number of operational scenarios under which CO_2 may be vented to atmosphere. The Operator's assessment of the acute impacts of CO_2 venting is set out in Section 10 of the Dispersion Modelling Assessment dated December 2023 of the Application.

The Applicant assessed the CC plant's potential emissions to air against the relevant air quality standards (UK HSE Workplace Exposure Limit (WEL)), and the potential acute impacts upon human health. These assessments predict the potential effects on human health from the CC plant's CO_2 vent using the ADMS modelling software version 6.

Environment Agency air quality specialists have audited the Applicant's assessment and are satisfied that that there is no significant risk to human health.

A pre-operational measure PO6 has been included in the Permit requiring the Operator to provide an updated assessment for approval to confirm the conditions when venting will occur before commissioning of the CC plant. Also included in this condition is a requirement for the Operator to submit to the Environment Agency for approval a management plan detailing operating techniques to minimise potential CO_2 phase changes, solid effects and dense gas behaviour when venting CO_2 atmosphere. This is included because the Operator's assessment assumes that CO_2 releases are (fully expanded) gas with no phase change and we, therefore, require the Operator to have plans in place to minimise the CO_2 phase changes, dense gas behaviour or incidents that could occur during the proposed venting operation. The approved vent management plan submitted under PO6 will be an operating technique under the permit.

5.4.2 Noise and vibration

The Application contained a noise impact assessment which identified local noise-sensitive receptors, potential sources of noise at the proposed plant and noise mitigation measures.

The Applicant considered the following scenarios: impacts from the existing incineration plant, impacts from the CC plant and impacts from the incineration plant and CC plant in combination. The incineration plant and CC plant are technically connected and a multi-operator installation. The background sound levels have been determined in the absence of the whole Installation for all scenarios. An assessment was carried out in accordance with BS 4142:2014+A1:2019 to compare the predicted Installation rating noise levels with the established background levels.

The primary sources of noise associated with the operation of the CC plant are the coolers, flue gas fan and flue gas discharge at the stack exit. Other,

additional sound sources would be located in buildings or structures. The following measures were described in the noise impact assessment to minimise noise:

- coolers fitted with low noise fans
- three sides of the roof top areas, where the coolers are installed, having parapet walls
- the flue gas fan having a silencer fitted
- the flue gas fan being housed in an enclosure

Noise emissions from the CC plant vary based on temperature. The coolers operate at an increased fan speed at higher temperatures to provide the necessary cooling demand. Specific sound levels associated with the operation of the CC plant have been calculated for 3 scenarios: operations with coolers at 50% capacity or less, operations with coolers at 50-90% capacity and operations with coolers at 100% capacity.

At the worst impacted receptor, the assessment concluded:

- a numerical impact of 6 dB based on coolers operating at 100% capacity
- a numerical impact of 3 dB based on coolers operating at 50-90% capacity
- a numerical impact of 2 dB based on coolers operating at <50% capacity.

According to BS 4142:2014+A1:2019, a difference of +5dB is likely to be an indication of the specific sound source having an adverse impact. BS 4142:2014+A1:2019 also indicates that the impact is dependent on the context of the sound environment at an assessment location. The Applicant stated that the coolers are unlikely to operate at 100% capacity for more than 0.4% of the year and this would be during daytime when higher background levels are likely. The coolers are expected to operate at 50% capacity, or lower, for 85% of the year. A difference of 0 dB-5 dB is likely to be an indication of the specific sound source having a below adverse impact.

We have carried out an audit of the Applicant's assessment and although we found higher rating levels than the Applicant, we agree that when the numerical impacts of the proposed CC plant are considered with the emissions from the incineration plant, excluding operations at 100% duty, the numerical impact of noise emissions from the proposed CC plant does not increase the overall impact of noise emissions above those already emitted from the existing permitted site.

Based upon the information in the application, we are satisfied that the appropriate measures will be in place to prevent or, where that is not practicable, to minimise noise and vibration and to prevent pollution from noise and vibration outside the site.

Pre-operational condition, PO10 requires the Operator to submit an updated noise impact assessment for assessment and written approval, following the

completion of the final design of the CC plant. We have included this measure to ensure that our conclusion on impacts remains valid and that the noise levels emitted from the final design of the plant are within those already assessed as part of the Application. We require the updated noise impact assessment to be carried out in accordance with BS4142:2014+A1:2019.

5.4.3 Emissions to water

The use of water is minimised by the re-use and re-circulation of water in the system, limiting the discharge to water. Any water that comes into contact with the amine solvent and its breakdown products will not be discharged to surface water.

The blowdown from the cooling towers will be discharged to Manchester Ship Canal via emission point W1. An H1 assessment was submitted by the Applicant and emissions were screened out as insignificant. Further modelling was required for Ammonia as outlined in guidance H1 annex D2: assessment of sanitary and other pollutants in surface water discharges and this was assessed. We agree with the Applicant's conclusions that, based on the information provided, the discharge would not impact the water quality standards for ammonia. The assessment is based on a worst-case maximum concentration. The concentrations of these pollutants are significantly lower than the EQSs. Other than improvement measure IC7 described below it is not considered necessary to set controls on this emission.

Based upon the information in the Application we are satisfied that appropriate measures will be in place to prevent and/or minimise emissions to water. We have included improvement measure IC7 in the Permit to confirm that this is the case once the CC plant is operational and in the unlikely event it is not then we can take further action. The improvement condition requires the Operator to submit a written report characterising the discharge to the Manchester Ship Canal once operations have commenced and to carry out a further assessment based on the actual emissions.

5.4.4 Emissions to sewer

There will be no discharges of process effluent to sewer.

5.4.5 Fugitive emissions

The IED specifies that plants must be able to demonstrate that the plant is designed in such a way as to prevent the unauthorised and accidental release of polluting substances into soil, surface water and groundwater. In addition, storage requirements for waste and for contaminated water under Article 46(5) of the IED must be arranged.

The Applicant has provided information regarding the storage and bunding of the raw materials that will be required for the operation of the CC plant. This is described in detail in section 4.2.2 of this document.

Based upon the information in the Application we are satisfied that appropriate measures will be in place to prevent and /or minimise fugitive emissions.

5.4.6 Summary of our conclusions of the CC plant's environmental impacts

As described in section 5, we are satisfied with the information provided in the application and that there will be no risk of significant impact. As this is emerging technology, we have included improvement and pre-operational conditions asking the Applicant to verify the assessments provided with the application based on operational experience. In the unlikely event these assessments do not confirm that there is no risk of significant impact further action will be taken to address this. We are satisfied the CC plant will operated in accordance with the emerging techniques guidance which is considered to be BAT.

6 Application of Emerging Techniques Guidance

6.1 Scope of Consideration

In this section, we explain how we have determined whether the Applicant's proposals are in accordance with the emerging techniques, or equivalent, for the carbon capture sector. We currently consider that meeting this guidance or proposing alternative measures that deliver an equivalent level of environmental protection demonstrates the use of BAT.

6.2 Post- combustion Carbon Dioxide Capture Emerging Techniques

We have reviewed the Application against the emerging techniques guidance for capture of CO_2: Post-combustion carbon dioxide capture: emerging techniques - GOV.UK (www.gov.uk).

The Applicant's response to each technique is set out in Annex 1 of this decision document together with our assessment of whether the Operator will be compliant with the relevant emerging techniques.

6.3 Monitoring

6.3.1 Monitoring during normal operations

We have decided that monitoring should be carried out for the parameters listed in Schedule 3 using the methods and to the frequencies specified in those tables. These monitoring requirements have been imposed in order to demonstrate compliance with ELVs, to enable correction of measured concentration of substances to the appropriate reference conditions and provide data regarding the quantity of CO_2 captured in order for the Operator to determine the capture rate of the CC plant.

For emissions to air, the methods for continuous and periodic monitoring are in accordance with our guidance for monitoring of stack emissions to air where methods are available.

Based on the information in the Application and the requirements set in the conditions of the Permit we are satisfied that the Operator's techniques, personnel and equipment will have either MCERTS certification or MCERTS accreditation as appropriate.

6.4 Reporting

We have specified the reporting requirements in Schedule 4 of the Permit either to meet the reporting requirements set out in the IED or in the emerging techniques guidance, or to ensure data is reported to enable timely review by us to ensure compliance with the Permit conditions and to monitor the efficiency of material use and the efficiency of the CC plant in capturing CO_2.

7 Other legal requirements

In this section we explain how we have addressed other relevant legal requirements, to the extent that we have not addressed them elsewhere in this document.

7.1 The EPR 2016 and related Directives

The EPR delivers the requirements of a number of European and national laws.

7.1.1 Schedules 1 and 7 to the EPR 2016 – **IED Directive**

We address the requirements of the IED in the body of this document above and the specific requirements of the emerging techniques guidance in Annex 1 of this document.

There is one requirement not addressed above, which is that contained in Article 5(3) IED. Article 5(3) requires that "In the case of a new installation or a substantial change where Article 4 of Directive 85/337/EC (now Directive 2011/92/EU) (the EIA Directive) applies, any relevant information obtained or conclusion arrived at pursuant to articles 5, 6 and 7 of that Directive shall be examined and used for the purposes of granting the permit."

- Article 5 of EIA Directive relates to the obligation on developers to supply the information set out in Annex IV of the Directive when making an application for development consent.
- Article 6(1) requires Member States to ensure that the authorities likely to be concerned by a development by reason of their specific

environmental responsibilities are consulted on the Environmental Statement and the request for development consent.
- Article 6(2)-6(6) makes provision for public consultation on applications for development consent.
- Article 7 relates to projects with transboundary effects and consequential obligations to consult with affected Member States.

The grant or refusal of development consent is a matter for the relevant local planning authority. The Environment Agency's obligation is therefore to examine and use any relevant information obtained or conclusion arrived at by the local planning authorities pursuant to those EIA Directive articles.

We have complied with our obligation under Article 9(2) so far as we are able in that no conclusion has yet been arrived at. Considering our role as consultee to the planning process we are satisfied that no additional or different Permit conditions are necessary.

7.1.2 Schedule 9 to the EPR 2016 – **Waste Framework Directive**

We must exercise our relevant functions for the purposes of ensuring that the waste hierarchy referred to in Article 4 of the Waste Framework Directive is applied to the generation of waste and that any waste generated is treated in accordance with Article 4 of the Waste Framework Directive. (See also section 4.3.9)

The conditions of the Permit ensure that waste generation from the facility is minimised. Where the production of waste cannot be prevented it will be recovered wherever possible or otherwise disposed of in a manner that minimises its impact on the environment. This is in accordance with Article 4.

We must also exercise our relevant functions for the purposes of implementing Article 13 of the Waste Framework Directive; ensuring that the requirements in the second paragraph of Article 23(1) of the Waste Framework Directive are met; and ensuring compliance with Articles 18(2)(b), 18(2)(c), 23(3), 23(4) and 35(1) of the Waste Framework Directive.

Article 13 relates to the protection of human health and the environment. These objectives are addressed elsewhere in this document.

Article 35(1) relates to record keeping and its requirements are delivered through permit conditions.

7.1.3 Schedule 22 to the EPR 2016 – **Water Framework and Groundwater Directives**

To the extent that it might lead to a discharge of pollutants to groundwater (a "groundwater activity" under the EPR 2016), the Permit is subject to the requirements of Schedule 22, which delivers the requirements of EU Directives relating to pollution of groundwater. The Permit will require the taking of all necessary measures to prevent the input of any hazardous

substances to groundwater, and to limit the input of non-hazardous pollutants into groundwater so as to ensure such pollutants do not cause pollution, and satisfies the requirements of Schedule 22.

No releases to groundwater from the Installation are permitted. The Permit also requires material storage areas to be designed and maintained to a high standard to prevent accidental releases.

7.1.4 Directive 2003/35/EC – **The Public Participation Directive**

Regulation 60 of the EPR 2016 requires the Environment Agency to prepare and publish a statement of its policies for complying with its public participation duties. We have published our public participation statement.

This Application is being consulted upon in line with this statement, as well as with our guidance RGN6 on Sites of High Public Interest, which addresses specifically extended consultation arrangements for determinations where public interest is particularly high. This satisfies the requirements of the Public Participation Directive.

Our draft decision in this case has been reached following a programme of public consultation, both on the original Application and later, separately, on the draft Permit and a draft decision document. The way in which this has been done is set out in Section 2. A summary of the responses received to our consultations and our consideration of them is set out in Annex 2.

7.2 National primary legislation

7.2.1 Environment Act 1995

(i) Section 4 (Pursuit of Sustainable Development)

We are required to contribute towards achieving sustainable development, as considered appropriate by Ministers and set out in guidance issued to us. The Secretary of State for Environment, Food and Rural Affairs has issued *The Environment Agency's Objectives and Contribution to Sustainable Development: Statutory Guidance (December 2002)*. This document:

"*provides guidance to the Agency on such matters as the formulation of approaches that the Agency should take to its work, decisions about priorities for the Agency and the allocation of resources. It is not directly applicable to individual regulatory decisions of the Agency*".

In respect of regulation of industrial pollution through the EPR, the Guidance refers in particular to the objective of setting permit conditions "*in a consistent and proportionate fashion based on Best Available Techniques and taking into account all relevant matters…*". The Environment Agency considers that it has pursued the objectives set out in the Government's guidance, where relevant, and that there are no additional conditions that should be included in this Permit to take account of the Section 4 duty.

(ii) Section 5 (Preventing or Minimising Effects of Pollution of the Environment)

We are satisfied that our pollution control powers have been exercised for the purpose of preventing or minimising, remedying or mitigating the effects of pollution.

(iii) Section 6(1) (Conservation Duties with Regard to Water)

We have a duty to the extent we consider it desirable generally to promote the conservation and enhancement of the natural beauty and amenity of inland and coastal waters and the land associated with such waters, and the conservation of flora and fauna which are dependent on an aquatic environment.

We consider that no additional or different conditions are appropriate for this Permit.

(iv) Section 6(6) (Fisheries)

We have a duty to maintain, improve and develop fisheries of salmon, trout, eels, lampreys, smelt and freshwater fish.

We consider that no additional or different conditions are appropriate for this Permit.

(v) Section 7 (General Environmental Duties)

This places a duty on us, when considering any proposal relating to our functions, to have regard amongst other things to any effect which the proposals would have on sites of archaeological, architectural, or historic interest; the economic and social well-being of local communities in rural areas; and to take into account any effect which the proposals would have on the beauty or amenity of any rural or urban area or on any such flora, fauna, features, buildings, sites or objects.

We considered whether we should impose any additional or different requirements in terms of our duty to have regard to the various conservation objectives set out in Section 7, but concluded that we should not.

(vi) Section 39 (Costs and Benefits)

We have a duty to take into account the likely costs and benefits of our decisions on the applications ('costs' being defined as including costs to the environment as well as any person). This duty, however, does not affect our obligation to discharge any duties imposed upon us in other legislative provisions.

In so far as relevant we consider that the costs that the permit may impose on the applicant are reasonable and proportionate in terms of the benefits it provides.

(vii) Section 81 (National Air Quality Strategy)

We have had regard to the National Air Quality Strategy and consider that our decision complies with the Strategy, and that no additional or different conditions are appropriate for this Permit.

We have also had regard to the clean air strategy 2019 and consider that our decision complies with the Strategy, and that no additional or different conditions are appropriate for this Permit.

We have had regard to the National Air Pollution Control Programme (set under the National Emissions Ceiling Regulations 2018) and consider that our decision complies with the Strategy, and that no additional or different conditions are appropriate for this Permit.

7.2.2 Section 108 Deregulation Act 2015 – Growth duty

We considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit.

Paragraph 1.3 of the statutory guidance issued by the Department of Business, Energy and Industrial Strategy in March 2017 says:

“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”

We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.

We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards. It also ensures that any pollution that may arise from the regulated facility does not adversely affect local businesses.

7.2.3 Legislative and Regulatory Reform Act 2006

In accordance with section 21 of this Act, when making this decision we have had regard to the need to be transparent, accountable, proportionate and consistent, and the need to target action where it is needed.

In accordance with section 22 of the Act we have had regard to the Regulators' Code; in particular the need to base our decision on environmental risk, and to support the applicant to comply and grow, so that burdens have only been imposed where they are necessary and proportionate.

7.2.4 Human Rights Act 1998

We have considered potential interference with rights addressed by the European Convention on Human Rights in reaching our decision and consider that our decision is compatible with our duties under the Human Rights Act 1998. In particular, we have considered the right to life (Article 2), the right to a fair trial (Article 6), the right to respect for private and family life (Article 8) and the right to protection of property (Article 1, First Protocol). We do not believe that Convention rights are engaged in relation to this determination.

7.2.5 Countryside and Rights of Way Act 2000 (CROW 2000)

Section 85 of this Act imposes a duty on Environment Agency to have regard to the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty (AONB). There is no AONB which could be affected by the CC plant.

7.2.6 Wildlife and Countryside Act 1981

Under section 28G of the Wildlife and Countryside Act 1981 the Environment Agency has a duty to take reasonable steps to further the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which a site is of special scientific interest. Under section 28I the Environment Agency has a duty to consult Natural England in relation to any permit that is likely to damage SSSIs.

We assessed the Application and concluded that the CC plant will not damage the special features of any SSSI. This was recorded on a CROW Appendix 4 form.

The Wildlife and Countryside Act (CRoW) assessment is summarised in greater detail in section 5.3.3 of this document. A copy of the full Appendix 4 Assessment can be found on the public register.

7.2.7 Natural Environment and Rural Communities Act 2006

Section 40 of the Natural Environment and Rural Communities Act 2006 has been amended with effect from 1 January 2023 to require consideration of the general biodiversity objective, which is to further the conservation and enhancement of biodiversity through the exercise of our functions.

We have considered the general biodiversity objective when carrying out our permit application determination and, consider that no different or additional conditions are required in the permit.

7.2.8 Countryside Act 1968

Section 11 imposes a duty on the Environment Agency to exercise its functions relating to any land, having regard to the desirability of conserving the natural beauty and amenity of the countryside including wildlife. We have done so and consider that no different or additional conditions in the Permit are required.

7.2.9 National Parks and Access to the Countryside Act 1949

Section 11A and section 5(1) imposes a duty on the Environment Agency when exercising its functions in relation to land in a National Park, to have regard to the purposes of conserving and enhancing the natural beauty, wildlife and cultural heritage of the areas, and of promoting opportunities for the understanding and enjoyment of National Parks by the public.

We have done so and consider that no different or additional conditions in the Permit are required. There is no National Park which could be affected by the CC plant.

7.3 National secondary legislation

7.3.1 Conservation of Habitats and Species Regulations 2017

We assessed the Application in accordance with our guidance and concluded that for the purposes of the Habitats Regulations there will be likely significant effects on any European site and undertook an Appropriate Assessment (Habitats Regulations Assessment Stage 2) of those effects.

We consulted Natural England on the appropriate assessment, and they agreed with our conclusion, that the operation of the CC plant would not have adverse effects on the interest features of European sites.

The Habitats Regulations Assessment is summarised in greater detail in section 5.3.2 of this document. A copy of the Habitats Regulations Assessment can be found on the public register.

We have also considered our general duties under Regulation 9(3) to have regard to the requirements of the Habitats Directive in the exercise of our powers and under Regulation 10 in relation to wild bird habitat to take such steps in the exercise of their functions as we consider appropriate so far as

lies within our powers to secure preservation, maintenance and re-establishment of a sufficient diversity and area of habitat for wild birds.

We considered whether we should impose any additional or different requirements in the permit in terms of these duties but concluded that we should not.

7.3.2 **Water Environment (Water Framework Directive) Regulations 2017**

Consideration has been given to whether any additional requirements should be imposed in terms of the Environment Agency's duty under regulation 3 to secure compliance with the requirements of the Water Framework Directive, Groundwater Directive and the EQS Directive through, amongst other things, environmental permits, and its obligation in regulation 33 to have regard to the river basin management plan (RBMP) approved under regulation 31 and any supplementary plans prepared under regulation 32. However, it is felt that existing conditions are sufficient in this regard and no other appropriate requirements have been identified.

We are satisfied that granting this application with the conditions proposed would not cause the current status of the water body to deteriorate.

7.4 Other relevant legal requirements

7.4.1 Duty to Involve

Section 23 of the Local Democracy, Economic Development and Construction Act 2009 require us where we consider it appropriate to take such steps as we consider appropriate to secure the involvement of interested persons in the exercise of our functions by providing them with information, consulting them or involving them in any other way. Section 24 requires us to have regard to any Secretary of State guidance as to how we should do that.

The way in which the Environment Agency has consulted with the public and other interested parties is set out in section 2.2 of this document. The way in which we have taken account of the representations we have received is set out in Annex 4. Our public consultation duties are also set out in the EP Regulations, and our statutory Public Participation Statement, which implement the requirements of the Public Participation Directive. In addition to meeting our consultation responsibilities, we have also taken account of our guidance in Environment Agency Guidance Note RGN6.

Annexes

Annex 1: Compliance with guidance: Post-combustion carbon dioxide capture (PCC) emerging techniques

We have considered the Applicant's proposals in accordance with the emerging techniques guidance and assessed whether the proposals are compliant with the guidance.

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
2.1 Energy efficiency in plants with PCC	You must maximise the thermal energy efficiency of the plant and of the supply of heat for the associated PCC plant.	N/A- application is for CC plant only. Energy efficiency is considered in permit EPR/XP3005LB	N/A	N/A
2.2 Dispatchable Operation	In line with the needs of a UK electricity system with a large amount of intermittent renewable generation, all thermal power plants, including those with CO_2 capture, are likely to be dispatchable. This means that the power plant operator can, within technical limits on rates of change in output and on minimum stable generation levels, operate the plant at any required output, up to its full load, at any time, and sustain this output indefinitely. CHP plants and EfW plant are not expected to be dispatchable, but some variation in output is likely. However, they may not be able to meet the requirements for good quality CHP over periods when electrical output is constrained. The design of the plant may be changed to help variable operation, possibly with a slight impact on full load thermal efficiency. Where you plan to install CO_2 capture onto a CHP plant, you must design the plant so that it can operate efficiently during periods of power only mode.	The CC plant has been designed so that the incineration plant can operate independently.	Y	Condition 2.3.1 with table S1.2 of the permit.

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	The primary purpose of an EfW plant is to treat waste. Therefore, they need to operate continuously. The PCC plant design and operation must be compatible with this.			
2.3 Supplying heat and power for PCC operation	You will need to use low grade (for example 130°C) heat and electrical power to operate the PCC plant. You should work out the amounts needed based on factors that include the: • selected solvent • PCC plant configuration • CO_2 capture level • CO_2 delivery pressure You should supply this heat and electricity from the main power plant. Where not possible, this will need to be by fuel combustion in ancillary plants (with CO_2 capture) that are then also treated as a power plant system for performance calculations. The ratio between heat supplied as steam (or otherwise) and electricity output lost will depend on the: • temperature at which you need to supply heat • steam condenser cooling water temperature You should consider using a back-pressure turbine if it is not possible to supply enough steam to the PCC plant by extracting steam from a condensing turbine. If the plant needs to supply heat for district heating, and extracting steam to supply the PCC plant will mean there is insufficient steam to do this, you should consider using heat pumps or other plant to reduce the amount of steam required to meet that heat demand.	The heat and electricity for the CC plant will be supplied by the incineration plant. High pressure steam will be drawn from the incineration plant and expanded through a back pressure turbine.	Y	Condition 2.3.1 with table S1.2 of the permit.
3. PCC plant design and operation				

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
3.1 Purpose	The purpose of the PCC plant is to maximise the capture of CO_2 emissions for either use or secure geological storage. You should aim to design your plant to achieve a CO_2 capture rate of at least 95% during normal operating conditions, although operationally this can vary, up or down. You will need to justify proposing a design CO_2 capture rate of less than 95% as an annual average of all normal operating conditions. You can submit a cost benefit analysis as part of your application.	The Applicant has stated that the CC plant has been designed for a CO_2 capture rate of 95% under normal operation.	Y	Condition 3.5.1 with table S3.3 of the permit and improvement condition IC3.
	You will need to deliver CO_2: • at local transport system pressures (gas phase such as 35 bar or dense phase such as 100 bar) • with levels of water, oxygen and other impurities as required for transport and storage such as that for the system operator National Grid (NGC/SP/PIP/25 Dec.2019)	The Applicant has stated that CO_2 will be conditioned and compressed so that it can be delivered at the parameters required by the CO_2 transport network provider. The Applicant states that to remove oxygen, the captured CO_2 will be dosed with hydrogen in the presence of a catalyst. The wet CO_2 stream is then dried using a pressure/temperature swing adsorption process using a suitable desiccant.	Y	Condition 2.3.1 with table S1.2 of the permit and pre-operational condition PO13.
	The PCC plant must also have acceptable environmental risks through preventing or minimising emissions or render them harmless. You must achieve environmental quality standards for air emissions from the PCC plant and their subsequent atmospheric degradation products (including, for example, nitrosamines and nitramines). You should confirm this using: • atmospheric dispersion and reaction modelling tools	The Applicant has provided an air impact assessment and an environmental risk assessment. We have reviewed these and we are satisfied that no environmental standards will be exceeded. Relevant ELVs are set in the permit.	Y	Condition 3.1.1 with table S3.1 of the permit and improvement condition IC6.

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	• specific site parameters which will define plant-specific ELVs			
3.2 Solvent selection	While the process design for the PCC plant is likely to be generally similar for all solvents, the amine solvent you select will determine details of the design and performance. Solvent types and published performance figures are described in the PCC evidence review. There is particular concern about impacts on the environment from nitrosamines and other potentially harmful compounds formed by reaction of the amines and their degradation products with nitrogen oxides (NOx) in the flue gases. Check the environmental standards for air emissions for the protective environmental assessment levels. You have a choice between: • solvents using primary amines that may require more heat for regeneration but will not readily form stable nitrosamines in the PCC plant, especially if a high level of reclaiming is used to remove degradation products • solvent formulations including secondary amines or other species that may have lower regeneration heat requirements but may readily form nitrosamines with NOx in the flue gases in the PCC plant – for controls, see section 3.3 on features to control and minimise atmospheric and other emissions	The Applicant proposes to use MEA, a primary amine based solvent due to the availability of information on the solvent properties.	Y	N/A
	The potential absorber stack emissions and resulting environmental impacts will depend on the selected solvent. Your air emissions risk assessment should assess your plant design and operation, taking into account local environmental factors. It should include:	The air emissions risk assessment includes impacts from direct emissions of the solvent components, from substances formed from the solvent components and from substances	Y	Condition 3.1.1 with table S3.1 of the permit and improvement condition IC6.

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	• direct emissions of solvent components • formation of additional substances in the PCC system and emissions of those substances • formation of further additional substances in the atmosphere from emissions from the PCC system	formed due to degradation of the solvents in the atmosphere.		
	The potential for solvent reclaiming and other cleaning methods is also an important factor in solvent selection. You should make sure it is practicable to remove all non-solvent constituents from the solvent inventory as fast as they are added during operation, to avoid accumulation. Your assessment should demonstrate that you will: • recover a high fraction of the solvent in the feed to the reclaimer during reclaiming • minimise reclaimer wastes and that they can easily be disposed of	The Applicant states that the amine solvent will be recycled via thermal reclamation. The reclaimer waste will be transferred off-site for disposal. Measures will be employed to minimise the volume of reclaimer waste. These include reduction of incoming pollutants via the DCC, control of temperature within the reboiler and use of a two-stage reclamation process to maximise the quantity of solvent recovered.	Y	Conditions 2.3.1 and 3.5.1 with tables S1.2 and S3.3 of the permit and improvement condition IC5.
	You must work out the performance of your solvent, including reclaiming requirements and modelling emissions to atmosphere. Determine this through realistic pilot (or full scale) tests using fully representative (or actual) flue gases and power plant operating patterns over a period of at least 12 months. You do not need to do this for your plant if information on the solvent performance is already available from pilots, tests, or regular operation at a similar plant.	The Applicant proposes to use MEA, a primary amine, based solvent. There is high availability of information on the solvent properties and performance in the public domain.	Y	Condition 3.5.1 with table S3.3 of the permit and improvement condition IC5.
3.3 Features to control and minimise atmospheric and other emissions				
3.3.1 Flue gas cleaning	SOx and HCl in the flue gas will readily react with amines to produce heat stable salts. These products are typically stable under reclaimer conditions,	The incineration plant includes an SNCR system, a dry lime acid gas abatement system, activated carbon and bag filters	Y	Permit EPR/XP3005LB before discharge

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	but the heat stable salt formation with SOx can be, at least partly, reversed by alkali addition in the solvent reclaiming process. SOx levels will affect solvent consumption but are expected to have a limited effect on emissions. For most gas, biomass and waste fuels that have intrinsically low S levels, adding more upstream SOx removal (and HCl removal for EfW) is likely to be primarily an economic decision. SOx removal can be in the power plant flue gas desulphurisation unit, flue gas treatment system or in the PCC direct contact cooler. SOx levels in the existing flue gases from an amine PCC plant will be expected to be at extremely low levels.	to abate particulates. This will control emissions of pollutants going into the CC plant to ensure that there is not significant degradation of the amine solution or creation of aerosols. The CC plant DCC will include a caustic scrubber to remove acid gases such as SO_2, HCl and HF from the flue gas prior to entry to the absorber. The CC plant will also include a water wash for the abatement of amines, ammonia and other basic species emissions. Demisters will be included in the absorber column to mitigate against the formation of mists and release of solvent vapour through a combination of collision & adherence, coalescence and drainage.		of flue gases to the CC plant and also condition 3.5.1 with table S3.3 of this permit and improvement condition IC5.
	The impact of NOx in the flue gas will vary significantly with the solvent composition. If the amine blend will form significant amounts of stable nitrosamines with NOx in the flue gas, then you must reduce NOx to as low a level as practicably possible (see LCP BREF) using selective catalytic reduction (SCR). EfW plants may be fitted with selective non catalytic reduction (SNCR) which does not reduce NOx in flue gas as much as SCR. If you are retrofitting PCC plant to an EfW plant which has SNCR NOx abatement, you should make sure the selected solvent is compatible with the abated flue gas. Both SCR and SNCR can result in ammonia (NH_3) slip. If necessary, it is expected that (NH_3) slip could be addressed in a suitably designed PCC unit. In all cases, you must assess the effects of NOx in the flue gas on atmospheric degradation reactions and this may also affect the need for SCR. If SCR is not fitted to a new build power plant, it is generally considered BAT to maintain space so it could be retrofitted,			Permit EPR/XP3005LB before discharge of gases to the CC plant.

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	should this be considered necessary to meet ELVs in the future.			
	Sulphur trioxide (SO_3) droplets and fine particulates should not be present in the flue gas. If they arise in the PCC process they can cause significant amine emissions. The level of emissions (mainly solvent amines) are not directly related to aerosol measurements. Monitoring aerosols is difficult and aerosol quantities may also vary significantly over time. Aerosols might be present, for example, because of significant SOx in the flue gas. Where this is the case, you should carry out long-term testing on a pilot plant or the actual plant, with all planned countermeasures in place, to show satisfactory operation. You should also carry out regular isokinetic sampling in the operational plant to assess total vapour and droplet emission levels. Other amine aerosol emission abatement techniques include: • cooling the flue gas gradually through the acid dewpoint • Brownian Demister Units • wet electrostatic precipitators • high lean solvent temperatures These techniques can reduce aerosol emission by enhancing aerosol growth in the top of the column, and the water wash. You may need to use a combination of these or other techniques.			Condition 2.3.1and 3.1.1 with tables S1.2 and S3.1 of the permit.
	You may need to remove materials in the flue gas that would accumulate as impurities in the solvent (such as metals, chlorine and fly ash) to lower concentrations than is required under the relevant BAT AELs. This is to ensure satisfactory PCC plant operation. Whether you need to do this will depend on the specific solvent properties and the effectiveness of the solvent	The Applicant proposes to use MEA, a primary amine, based solvent. There is high availability of information on the solvent properties and performance in the public domain. The incineration plant includes an SNCR	Y	Permit EPR/XP3005LB and condition 3.5.1 with table S3.3 of the permit and improvement

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	management equipment (such as filtering and reclaiming). You should assess the effects of flue gas impurities through realistic, long term pilot testing. In general, your PCC plant must abate these types of flue gas impurities before the residual flue gases are finally released to atmosphere.	system, a dry lime acid gas abatement system, and bag filters. This will control emissions of pollutants going into the CC plant to ensure that there is not significant degradation of amine solution or creation of aerosols.		condition IC5.
3.3.2 PCC system operation				
Operating temperatures	You must establish and maintain optimum temperature and appropriate limits in the solvent stripping process. Elevated temperatures can cause some thermal degradation of the solvent. But higher peak average temperatures during regeneration will also likely promote reduced energy requirements and higher CO_2 capture levels. You must balance both to ensure the right environmental outcome. Where feasible, you should avoid locally higher metal skin temperatures, such as from the use of superheated steam in heaters, as this provides no benefit and can result in degradation.	The Applicant states that the amine stripper/reboiler temperature will be controlled and be between 110-126^{o}C to prevent the amine degradation.	Y	Condition 2.3.1 with table S1.2 of the permit.
Solvent degradation	You should minimise oxidative degradation of the solvent by reduced solvent residence times in the absorber sump and other hold-up areas. Direct O_2 removal from rich solvent may be developed in the future but has not yet been proven at scale.			Condition 3.5.1 with table S3.3 of the permit and improvement condition IC5.
3.3.3 Absorber emissions abatement				
Water wash	You must use one or two water washes or a scrubber to return amine and other species to the solvent inventory. Capture levels are limited by vapour or liquid equilibria, with volatile amines captured less effectively. Any aerosols present will also not be captured effectively. Water washes alone are ineffective in	The Applicant states that the CC plant includes a water wash which will abate amines and their degradation products. The Applicant states that an acid wash is not required due to the emissions	Y	Condition 2.3.1 with table S1.2 of the permit.

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	preventing NH_3 emissions, as concentrations will increase until the rate of release balances the rate of formation (and possibly addition from SCR or SNCR slip).	levels that can be achieved using a water wash. The plant will be designed with space for a second water wash if required.		
Acid wash	An acid or other chemically active wash or scrubber after the water wash will react with amines, NH_3 and other basic species and reduce them to very low levels (for example, 0.5 to 5mg per m^3 per species or lower). You should implement an acid wash as it is considered to be BAT, unless: • emission levels are already at acid wash levels with a water wash • you can show that the need to dispose of the acid wash waste outweighs the benefits of the additional reduction in emissions to atmosphere Depending on PCC system configuration, an absorber acid wash can also counteract NH_3 slip from an SCR system. If an acid wash is not fitted, you should consider a second water wash as an acid wash if: • emissions performance is worse than expected • you wish to change to a more volatile solvent An acid wash is not likely to trap aerosols.			Condition 3.5.1 with table S3.1 of the permit.
Droplet removal	You must prevent emissions of aerosols. To do this you could use standard droplet removal sections after washes. These will prevent droplet carryover from the wash. However, they are not effective against very fine aerosols arising from SO_3 or other aerosol mists.	The Applicant states that the CC plant will include high efficiency demisters in the absorber column to mitigate against the formation of mists and release of solvent vapour.	Y	Condition 2.3.1 with table S1.2 of the permit.
Stack Height	Where modelling predicts that you may need to raise the	The Applicant states that the stack	Y	N/A

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	temperature at the point of release to aid dispersion, you can: • increase the design stack height • add flue gas reheating Flue gas reheating can also reduce the plume visibility. Heat from cooling the flue gas before the PCC plant or waste heat from the PCC process should be used for flue gas reheating (see section 4 on cooling)	height for the CC plant has been optimised. Detailed dispersion modelling showed that the temperature of the release has a significant effect on the level of dispersion of emissions. The stack height proposed (110 m) is taller than the existing incineration plant stack		
3.4 Process and emissions monitoring				
3.4.1 Role of monitoring	The main purpose of monitoring the PCC process is to show that the emissions from the process, primarily to air, are not causing harm to the environment. You must also carry out monitoring to show that resources are being used efficiently. This includes: • energy and resource efficiency • CO_2 capture rate • verification that the CO_2 product is suitable for safe transport and storage You will need to develop a monitoring plan for both a commissioning phase and routine operation. During the commissioning phase you will need to optimise the operating envelope for the process. When you have achieved this the process operation will then become routine, along with the monitoring.	A continuous emissions monitoring system (CEMS) will monitor emissions of CO_2 and ammonia. This will be used to demonstrate compliance with the EP requirements. A range of methods for process monitoring will be carried out, this will be used to show that resources are being used efficiently. These methods will include energy and resource efficiency, capture efficiency, and verification that the CO_2 is suitable for safe transport and storage. A monitoring plan for the commissioning phase and routine operation will be developed. Where appropriate monitoring will meet the MCERTS standards, and any lab used will be UKAS accredited.	Y	Conditions 2.4.1, 2.5.1, 3.1.1 and 3.5.1 with tables S3.1 and S3.3 of the permit, improvement conditions IC3 and IC4 and pre-operational conditions PO4, PO11 and PO13.

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	It's likely you'll need to do more extensive monitoring during commissioning than during routine operation. As PCC is an emerging technique, you will need to develop monitoring methods and standards. You should include proposals for this in your permit application.	Following completion of the detailed design and prior to commencement of commissioning, the Applicant will be required to submit a written commissioning plan. This should include a commissioning monitoring plan.	Y	Conditions 2.5.1 and 3.5.1 with table S3.1 of the permit and pre-operational condition PO4.
	You must demonstrate compliance with ELVs in the permit by monitoring emissions at authorised release points. You must also show that you are managing the process to prevent (or minimise) the formation of solvent degradation products.	CEMS is included at the outlet of the CC plant to monitor emissions of CO_2 and ammonia. Other pollutants will be monitored periodically. This will be used to demonstrate compliance with the EP requirements and be used to demonstrate the efficiency of the operation of the absorber. A number of process monitoring measures will be in place to demonstrate management of the process and minimise the formation of solvent degradation products.	Y	Condition 3.5.1 with table S3.1 of the permit.
	Where monitoring shows that degradation products are being formed (and may be released), you must reduce these and any solvent emissions to the permitted level. This process control monitoring will also be part of the permit conditions.	The design of the CC plant incorporates a number of measures to monitor and control the process including the following: Foaming Corrosion Amine solvent efficiency, quality and degradation Maximum solvent temperature and solvent loss	Y	Conditions 2.4.1, 2.5.1 and 3.5.1 with table S3.3 of the permit and pre-operational condition PO5 and improvement condition IC5.

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
3.4.2 Point source emissions to air	You must include monitoring to demonstrate compliance with: • IED Chapter IV • WI BREF BAT AELs at normalised conditions You must also monitor for: • ammonia • volatile components of the capture solvent • likely degradation products such as nitrosamines and nitramines Your monitoring may be by either: • continuous emissions monitoring ('on line') • periodic extractive sampling ('off line') – where aerosol formation is expected, this must be isokinetic	Monitoring for the incineration plant is not considered in this Application. Monitoring of the flue gases at the absorber stack prior to release to atmosphere will be as follows: • Continuous monitoring: ammonia • Periodic monitoring: primary amines, secondary amines, nitrosamines, nitramines, and aldehydes.	Y	Permit EPR/XP3005LB before discharge of gases to the CC plant. Conditions 2.5.1 and 3.5.1 with table S3.1 of the permit and pre-operational condition PO8.
	Emission sampling point must also comply with M1 sampling requirements for stack emission monitoring.	The Applicant has confirmed that the sampling techniques and platforms will be designed to comply with the guidance.	Y	Conditions 2.3.1, 2.4.1 and 2.5.1 with table S1.2 of the permit and improvement condition IC2 and pre-operational condition PO8.
3.4.3 Process control monitoring	You should use process control monitoring or periodic sampling with off-line analysis to control the CO_2 capture and the solvent reclaiming performance. Parameters you should consider monitoring include: • absorber solvent quality – percentage active solvent • CO_2 loading both rich and lean solvent	To monitor the quality of the solvent checks will be undertaken for parameters such as colour, pH, conductivity and acid gas loading. Samples will be sent to an accredited laboratory for detailed analysis to monitor heat stable salts and amine	Y	Conditions 2.4.1, 2.5.1 and 3.5.1 with table S3.3 of the permit, improvement condition IC5 and pre-operational

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	• maximum solvent temperature • heat stable solvent content • solvent colour or opacity • soluble iron and other metals and degradation products • in water or acid washes and scrubbers – pH, conductivity, loading of abated substances, flow rate	degradation products.		condition PO5.
3.4.4 Monitoring of CO_2	You should also include: • CO_2 mass balance • CO_2 in fuel combusted • CO_2 capture rate (as a percentage) • CO_2 released to the environment • CO_2 quality	The incineration plant and the CC plant will undertake continuous monitoring of CO_2 allowing for calculation of the capture rate. CO_2 quality will be analysed prior to export.	Y	Conditions 2.4.1, 3.1.1 and 3.5.1 of the permit with tables S3.1 and S3.3 of the permit and improvement condition IC3.
3.4.5 Monitoring Standards	The person who carries out your monitoring must be competent and work to recognised standards such as the Environment Agency's monitoring certification scheme (MCERTS). MCERTS sets the monitoring standards you should meet. The Environment Agency recommends that you use the MCERTS scheme where applicable. You can use another certified monitoring standard, but you must provide evidence that it is equivalent to the MCERTS standards. There are no prescriptive BAT requirements for how to carry out monitoring. Monitoring methods need to be flexible to meet specific site or operational conditions. You must use a laboratory accredited by the United Kingdom Accreditation Service (UKAS) to carry out analysis for your monitoring.	Where appropriate, monitoring will meet the MCERTS standards, and external laboratories utilised to undertake monitoring/analysis will be UKAS accredited. .	Y	Condition 3.5.3 of the permit.

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
3.5 Unplanned emissions to the environment	You should propose a leak detection and repair programme that is appropriate to the solvent composition. This should use industry best practice to manage releases, including from joints, flanges, seals and glands. Your hazard assessment and mitigation for the plant must consider the risks of accidental releases to environment. This should also consider the actual composition of the fluids, gases and vapours that could be released from the plant after an extended period of operation. (Not only fresh solvent as initially charged.)	The Applicant has stated that a leak detection and repair programme will be developed and is subject to detailed design of the plant.	Y	Condition 1.1.1 and 3.2.3 of the permit.
3.6 Capture level, including during flexible operation	Capturing at least 95% of the CO_2 in the flue gas is considered BAT. You can base this on average performance over an extended period (for example, a year). To achieve this, you should make sure the design capture level for flue gas passing through the absorber equates to at least 95% of the CO_2 in the total flue gas from the power plant. If you process less than the full flue gas flow, your capture rate will have to be correspondingly higher. Over the averaging period, your capture level may vary up or down.	The Applicant has stated that the CC plant has been designed for a minimum CO_2 capture rate of 95% under normal operation and will operate continuously when the incineration plant is in stable operation.	Y	Condition 3.5.1 with table S3.3 of the permit and improvement condition IC3.
	As the fraction of intermittent renewable generation in the UK rises, CCS power plants will need to start and stop more often, and possibly also operate at variable loads. It is therefore important that CO_2 can also be captured at high levels during these periods, including during start-up and shutdown, to maintain high average capture levels. A method to maintain capture at normal rates or higher at all times using solvent storage has been identified in the BAT review. This, or alternatives that can achieve equivalent results, is considered BAT. If your PCC plant is not initially constructed with this capability, your permit application should show how you	Due to insufficient heat and power required to operate the CC plant during start up and shutdown, the CC plant will not be operational until the incineration plant is in stable operation. Incineration plants tend to operate continuously with infrequent shutdowns.		N/A

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	may retrofit it.			
3.7 Compression	You should select CO_2 compressors based on the expected duty. You should consider how any waste heat arising may be used. For base load operation, you should use integrally geared units because they give the: • maximum full-load efficiency • minimum number of compression trains For flexible and part-load operation, smaller compression trains (for example 2 at 50% compared to 1 at 100%) may be preferable. The use of different types of compressor or pump in series may also be preferable, to give greater flexibility at the expense of slightly lower full-load efficiencies.	The Applicant has stated that detailed CO_2 compression design will be developed by a contractor during the FEED and design stages of the project. The compressor will be of multistage design and will include intercooling.	Y	Condition 2.5.1 with pre-operational condition PO13.
3.8 Noise and odour	The LCP BREF and EfW BREF already cover noise impacts for the main power plant. You only need to consider additional process steps in PCC technology that have high potential for noise and vibration. In particular, CO_2 compression could be an area of concern. Once you've identified the main sources and transmission pathways, you should consider the use of common noise and vibration abatement techniques and mitigation at source wherever possible. For example: • use of embankments to screen the source of noise • enclosure of noisy plant or components in sound-absorbing structures • use of anti-vibration supports and interconnections for equipment	The Applicant submitted a noise impact assessment with the Application. The noise impact assessment is considered in section 5.4.2.	Y	Conditions 2.5.1, 3.4.1 and 3.4.2 of the permit and pre-operational condition PO10.

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	• orientation and location of noise-emitting machinery • change of the frequency of the sound			
	The handling, storage and use of some amines may result in odour emissions, so you should always use best practice containment methods. Where there is increased risk that odour from activities will cause pollution beyond the site boundary, you will need to send an odour management plan with your permit application	Under normal operation the CC plant is not anticipated to result in additional odour impacts.	Y	Conditions 3.3.1 and 3.3.2 of the permit.
3.9 Hot potassium carbonate post combustion capture plant	Using electrically powered hot potassium carbonate as an alternative solvent to amines for capturing CO_2 is an emerging technique that may have some advantages where the on-site availability of steam supply is insufficient for amine regeneration. The configuration of the plant is similar with flue gas clean up, absorber and desorber columns and solvent reclamation. The process is carried out at pressures between 10 and 100 pounds per square inch (PSI) and so requires a flue gas compressor – see the PCC evidence review. Advantages include: • potentially less hazardous than other solvents • can be driven by electricity – no need to extract steam • pressurised capture process – smaller volumes of gases • higher tolerance to oxygen Disadvantages include: • requires a complex large compressor, expander, heat recovery or exchanger which is expensive and high maintenance	The Operator is not using this capture process.	N/A	N/A

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	• use of electricity is less efficient than steam • not as effective on flue gas with low CO_2 concentration – for example, combined cycle gas turbine (CCGT) • some CO_2 slip so achievable capture efficiency is likely to be 90% not 95% Where you choose to use this carbon capture technique you should justify why in your permit application.			
4. Cooling	You will be able to achieve the best power and CO_2 capture plant performance by using the lowest temperature cooling available. You should use the hierarchy of cooling methods as follows: • direct water cooling (such as seawater) • wet cooling towers • hybrid cooling towers • dry cooling – direct air-cooled condensers and dry cooling towers	Cooling will be provided through the use of hybrid cooling towers, with supplementary cooling provided by air cooled condensers to minimise water abstraction and discharge.	Y	N/A
	Power plants that are retrofitted with PCC using steam extraction, or are intended to be able to operate without capture, can share water cooling between the power plant and the PCC system. This is because the cooling load on the main steam condensers falls with increased steam extraction rate. This shift away from condenser cooling will not apply for systems with direct air-cooled condensers. It may also be possible to reuse cooling water after the main condensers for higher-temperature cooling applications in the PCC plant. However, site specific water discharge temperature limits may be an issue for direct cooling.	Condensate from the DCC will be used as make-up water in the hybrid cooling towers and so sharing water cooling has not been considered. The only discharge from the cooling towers will be blowdown.	N/A	N/A

Reference*	Guidance	Applicant's Proposals	Compliant Y/N	Delivered by
2. Power Plant selection and integration with the PCC plant				
	A feature of PCC is that you have to remove heat from a flue gas stream that was originally not cooled. You can still achieve rejection of heat to atmosphere by heating the flue gas leaving the absorber, using heat from the incoming flue gas. You can do this either: • directly – such as using a rotary gas-gas heater • indirectly – such as using a heat transfer fluid or low-pressure steam	Heat will be drawn from the hot condensate generated in the reboiler.	Y	Condition 2.3.1 with table S1.2 of the permit.
	Lean and rich solvent storage may also help you achieve satisfactory PCC performance during periods of high cooling demand.	Lean and rich solvent storage has not been considered, cooling will be through hybrid coolers and air coolers to provide supplementary cooling capacity.	N/A	N/A
	You should refer to the Environment Agency's evidence on cooling water options for the new generation of nuclear power stations in the UK when considering options for cooling. This gives an overview of UK power station cooling water systems in use in the UK and abroad.	The Applicant has considered the cooling technologies that are appropriate for the CC plant and selected the hybrid cooling technology with supplemental air coolers.	Y	N/A
5. Discharge to water	For discharges to water, you should refer to the guidance on surface water pollution risk assessment for your environmental permit. For best practice in plume dispersal modelling, see the Joint Environmental Program report 'A protocol on projects modelling cooling water discharges into TrAC waters within power station developments'.	The cooling tower blowdown will be discharged to the Manchester Ship Canal. This is considered further in section 5.4.3.	Y	Conditions 2.4.1 and 3.1.1 with table S3.2 of the permit and improvement condition IC7.
***** The reference number corresponds with the numbering as set out in the Post-combustion carbon dioxide capture: emerging techniques - GOV.UK (www.gov.uk)				

Annex 2: Pre-Operational Conditions

Based on the information in the Application, we consider that we do need to impose pre-operational conditions. These conditions are set out below and referred to, where applicable, in the text of the decision document. We are using these conditions to require the Operator to confirm that the details and measures proposed in the Application have been adopted or implemented prior to the operation of the CC plant.

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
PO1	**Environmental Management System** Prior to the commencement of commissioning, the operator shall send a summary of the site Environmental Management System (EMS) to the Environment Agency and obtain the Environment Agency's written approval to the EMS summary. The operator shall make available for inspection all documents and procedures which form part of the EMS. The EMS shall be developed in line with the requirements set out in Environment Agency web guide on developing a management system for environmental permits (found on www.gov.uk). The documents and procedures set out in the EMS shall form the written management system referenced in condition 1.1.1 (a) of the permit.
PO2	**Storage and secondary containment** At least 3 months prior to the commencement of commissioning of the carbon capture plant, the operator shall submit a written report to the Environment Agency for assessment and written approval. The report must contain: • Detailed design for all containment structures which contain relevant hazardous substances including tanks and pipework as well as secondary and tertiary containment where required. The operator must implement the proposals in the report in accordance with the Environment Agency's written approval.
PO3	**Pollution prevention measures** At least 3 months prior to the commencement of commissioning of the carbon capture plant, the operator shall submit a written plan to the Environment Agency for assessment and written approval. The plan must contain: • Pollution prevention measures including inspection and maintenance plans and procedures around the storage and use of all chemicals identified as relevant hazardous substances in the Stage 1-3 assessment of the Site Condition Report. The operator must implement the proposals in the report in accordance with the Environment Agency's written approval.
PO4	**Commissioning plan** At least 3 months prior to the commencement of commissioning of the 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

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
	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. • A Commissioning Monitoring Plan. • 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.
PO5	**Process monitoring methods** Following the completion of the final design of the carbon capture plant and at least 6 months prior to the commencement of commissioning the operator shall submit to the Environment Agency for assessment and written approval proposed 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
PO6	**CO_2 venting assessment** Following the completion of the final design of the carbon capture plant and at least 12 months prior to the commencement of commissioning, the operator shall submit to the Environment Agency for assessment and written approval a report that reviews the outcomes of the CO_2 venting emissions to air risk assessment presented in the application EPR/QP3724SE/A001. This report shall include but not be limited to: • confirmation of the vent location(s) • information on how modelling has been used to inform the process design and manage risks associated with CO2 venting. This should include a description of the different potential venting scenarios • confirmation that the design is in line with industry best practice, such as that produced by the Energy Institute, or other equivalent guidance

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
	• description of the operating techniques to minimise the risks associated with venting CO2 to atmosphere and limit venting scenarios to those considered in their application • a vent management plan which is in keeping with our published guidance on emerging techniques for post-combustion carbon capture and industry best practice, such as that produced by the Energy Institute, or other equivalent guidance.
PO7	**<u>Carbon capture plant other than normal operating conditions (OTNOC) plan</u>** Following the completion of the final design of the carbon capture plant and prior to the commencement of commissioning of the carbon capture plant, the operator shall submit to the Environment Agency for assessment and written approval a post combustion carbon capture (PCC) plant OTNOC management plan. The plan shall include: (i) Any potential 'other than normal operating conditions (OTNOC)' for the carbon capture plant, taking into consideration both internal and external causes of OTNOC. (ii) Details of measures to: • minimise the occurrence of OTNOC that are within the operator's control; and • reduce the impact of all OTNOC events. (iii) Proposals for reviewing and optimising capture performance periodically so capture rates are as high as reasonably practicable during these periods. The OTNOC plan shall be included in the EMS.
PO8	**<u>Monitoring standards</u>** At least six months before (or other date agreed in writing with the Environment Agency) the commencement of commissioning of the carbon capture plant, the operator shall submit a written report to the Environment Agency, and obtain the Environment Agency's written approval for it, specifying arrangements for continuous and periodic monitoring of emissions to air from the CC plant's emission points to comply with EN 15259 and Environment Agency guidance notes on monitoring stack emissions measuring locations, techniques and standards for periodic monitoring and TGN M20 for quality assurance of CEMS. The report shall include the following: • Details of monitoring locations, access and working platforms. • Evidence that CEMS are MCERTS certified at the appropriate range. • Evidence that data handling and acquisition systems are MCERTS certified. • Methods and standards for periodic monitoring. • Procedures for the quality assurance of CEMS, which includes evidence of completion of CEMS' functional tests and setting up quality assurance level (QAL) 3 checks, prior to completing a QAL2.
PO9	**<u>Site condition report</u>**

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
	Prior to the commencement of commissioning, the operator shall submit a report, and obtain the Environment Agency's written approval to it, on the baseline conditions of soil and groundwater at the CC plant. The report shall contain the information necessary to determine the state of soil and groundwater contamination so as to make a quantified comparison with the state upon definitive cessation of activities provided for in Article 22(3) of the IED. The report shall contain information, supplementary to that already provided in application Site Condition Report, needed to meet the information requirements of Article 22(2) of the IED.
PO10	**Noise Impact Assessment (NIA)** Following the completion of the final design of the carbon capture plant and at least 6 months prior to the commencement of commissioning, the operator shall submit an updated NIA for assessment and written approval by the Environment Agency. The NIA shall be in accordance with BS4142:2014+A1:2019 (Rating industrial noise affecting mixed residential and industrial areas) or other methodology in accordance with the Environment Agency. The assessment shall be based on the final design of the Installation.
PO11	**Carbon capture efficiency** At least 3 months prior to the commencement of commissioning, the operator shall submit the following to the Environment Agency for approval: • a methodology 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 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.
PO12	**Water treatment plant** Following the completion of the final design of the carbon capture plant and at least 6 months prior to the commencement of commissioning, the operator shall submit a report, and obtain the Environment Agency's written approval to it, specifying the design of the water treatment plant
PO13	**CO_2 conditioning and compression** Following the completion of the final design of the carbon capture plant and at least 6 months prior to the commencement of commissioning, the operator shall submit a report, and obtain the Environment Agency's written approval to it, specifying the arrangements for the captured CO_2 conditioning and compression.

Annex 3: Improvement Conditions

Based in the information in the Application we consider that we need to set improvement conditions. These conditions are set out below - justifications for these is provided at the relevant section of the decision document. We are using these conditions to require the Operator to provide the Environment Agency with details that need to be established or confirmed during and/or after commissioning.

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
IC1	**Calibration and verification testing** The operator shall submit a written summary report to the Environment Agency to confirm by the results of calibration and verification testing that the performance of Continuous Emission Monitors for parameters as specified in Table S3.1 complies with the requirements of BS EN 14181, specifically the requirements of QAL1, QAL2 and QAL3. The report shall include the results of the calibration and verification testing.	Initial calibration report to be submitted to the Environment Agency within 3 months of completion of commissioning of the carbon capture plant. Full summary evidence compliance report to be submitted within 18 months of completion of commissioning of the carbon capture plant.
IC2	**Monitoring standards** During commissioning, the operator shall carry out tests to assess whether the air monitoring location(s) meet the requirements of BS EN 15259 and supporting Method Implementation Document (MID). A written report shall be submitted for approval setting out 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 time scale in the notification. The proposals shall be implemented in accordance with the Environment Agency's written approval.	Report to be submitted to the Environment Agency within 3 months of completion of commissioning of the carbon capture plant.
IC3	**Carbon capture efficiency**	Within 15 months from the

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	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 under normal operating conditions (calculated using the methodology as approved in accordance with pre-operational condition PO11 in table S1.4 of this permit) averaged over one year of operation as specified in table S3.3 of this permit. Should the carbon capture efficiency during normal operating conditions be 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: • Submit written proposals for remedial actions designed to improve capture efficiency to the Environment Agency for approval; 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.	completion of commissioning of the carbon capture plant.
IC4	**Commissioning of the carbon capture plant** The operator shall submit a written report to the Environment Agency for assessment and written approval on the commissioning of the carbon capture plant. The report shall summarise the environmental performance of the plant as set out in the commissioning plan required by pre-operational condition PO4 in table S1.4 of this permit. The report shall include: • a summary of the environmental performance of the carbon capture plant as installed against the design parameters and risk assessments set out in the application EPR/QP3724SE/A001 and updated in response to the pre-operational conditions in this permit; • a review of the performance of the carbon capture plant 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 6 months of the completion of commissioning of the carbon capture plant.
IC5	**Amine solvent degradation** 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.	Within 15 months from the completion of commissioning of the carbon capture plant.

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	The report shall include: • an investigation into the reasons for solvent degradation and how degradation affects 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.	
IC6	**Air emissions risk assessment (Carbon capture plant)** 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 the Environment Agency's guidance which is based on sampled and monitored emissions data from emission point A7 in table S3.1 and on the parameters set out in table S3.1 of permit EPR/XP3005LB. 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 EPR/QP3724SE/A001. For any 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 the operator should propose a new EAL. To derive a new EAL, the operator should follow the Environment Agency's published guidance on air emissions risk assessments.	Within 15 months of commencement of operation of the carbon capture plant.
IC7	**Emissions to water** The operator shall submit a written report to the Environment Agency for technical assessment and written approval. The report must contain: • a full characterisation of the discharge to Manchester Ship Canal from emission point W2 • the collected monitoring data and results from a minimum of 12 months of sampling and monitoring of effluent discharges from emission point W2 at a minimum frequency of a minimum	Within 15 months of commencement of operation of the carbon capture plant.

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	of one sample a month • confirmation and evidence that the sampling and monitoring has been undertaken in line with the Environment Agency guidance on 'Surface water pollution risk assessment for your environmental permit' and 'Monitoring discharges to water: guidance on selecting a monitoring approach' (found on www.gov.uk) • a completed H1 assessment(s) and/or modelling output results which take into consideration relevant environmental standards as specified in Environment Agency guidance 'Surface water pollution risk assessment for your environmental permit' (found on www.gov.uk) • a comparison of the conclusions of the updated H1 assessment and/or modelling results against the conclusions of the H1 assessment submitted in application EPR/QP3724SE/A001 • where the results of the updated H1 assessment and/or modelling show that significant/adverse impact is likely from the emissions of any of the parameters, the operator shall cease further discharge of the site effluent and shall provide proposals and timescales on how to manage the effluent to ensure discharges have insignificant impact on receiving waters.	

Annex 4: Consultation Reponses

A) Advertising and Consultation on the Application

The Application has been advertised and consulted upon in accordance with the Environment Agency's Public Participation Statement. The way in which this has been carried out along with the results of our consultation and how we have taken consultation responses into account in reaching our draft decision is summarised in this Annex. Copies of consultation responses have been placed on the Environment Agency public register.

The Application was advertised on the Environment Agency website from 28/02/2024 to 28/03/2024 and in the Liverpool Echo and Runcorn & Widnes Weekly News on 29/02/2024. The Application was made available to view at the Environment Agency's Public Register.

The following statutory and non-statutory bodies were consulted:

- Halton Environmental Protection Department
- Fire & Rescue (Merseyside)
- UK Health Security Agency
- Health and Safety Executive
- Food Standards Agency

1) Consultation Responses from Statutory and Non-Statutory Bodies

Response Received from UK Health Security Agency (08/04/2024)	
Brief summary of issues raised:	**Summary of action taken / how this has been covered**
Based on the information contained in the application supplied, UKHSA has no significant concerns regarding the risk to the health of the local population from the installation.	No action required.

2) Consultation Responses from Members of the Public and Community Organisations

a) Representations from Local MP, Councillors and Parish / Town / Community Councils

No responses received

b) Representations from Community and Other Organisations

No responses received.

c) Representations from Individual Members of the Public

A total of 13 of responses were received from individual members of the public.

Brief summary of issues raised:	Summary of action taken / how this has been covered
Comments about noise impacts	
Concern over how the noise assessment was carried out including: • Background noise levels are not representative • Choice of receptors • Nighttime noise	An updated noise impact assessment was submitted on 10/12/2024 in response to a Schedule 5 Notice. We audited the Applicant's noise assessment. As part of the audit, we checked that these factors were considered appropriately by the Applicant and we are satisfied that they were. See section 5.4.2 for further details.
Concern over noise impacts including claims that the existing plant is already causing adverse impacts.	We audited the Applicant's noise assessment, and we are satisfied that there will not be a significant impact from noise from the CC plant. Noise from the existing activity will be addressed through the regulation of that activity. See also response to next comment. Our assessment of noise is considered in section 5.4.2. We are satisfied that the appropriate measures will be in place to prevent or, where that is not practicable, to minimise noise and vibration and to prevent pollution from noise and vibration outside the site.
Comments about the Applicant	
Concern that there have been complaints regarding noise, steam, odour and light pollution at the incineration plant.	The comments relate to the operation of the incineration plant which is operated by a different operator to that of the CC plant and are not matters for consideration of this Application. However, the complaints have been investigated and the operator of the incinerator has been required to take remedial action where necessary. We are satisfied that the operation of the CC plant will not cause significant pollution of the environment or harm to human health.
Comments about the application	
Concerns over lack of specific information in the application preventing meaningful assessment of the installation.	We consider we have sufficient information to determine this application and are satisfied that the Applicant has considered the impacts of emissions and will have appropriate plans in place to manage risks. We have included pre-operational and improvement conditions which include

	providing the detail of the final design of the plant before operation and validating any assessments.
Concerns over failure to follow guidance on solvent selection.	The Applicant proposes to use monoethanolamine (MEA), a primary amine, based solvent. There is high availability of information on the solvent properties and performance in the public domain. We are satisfied that the Applicant has considered the selection of the solvent in accordance with our guidance.
Concerns over failure to follow guidance on absorber emissions abatement.	There will be a water wash at the top of the absorber stack. The air dispersion model provided by the Applicant shows that emissions are 'not significant' without an acid wash. We are satisfied that the Applicant's proposals for abatement are in accordance with our guidance. We have included an improvement condition which requires the operator to review the assessment.
Comments about other issues	
The consultation was not adequate.	We are satisfied that we took appropriate steps to inform people about the Application and how they could comment on it. How we did this is described in section 2 of this decision document.
Concern over the impact of light pollution	Pollution from light is primarily a concern for considering visual impacts and should be considered as part of the related planning application. In any event light pollution is not likely to have a significant effect on health or the environment.
Concern over the storage of CO_2 and where it is to be stored	The captured CO_2 will be discharged from the site into a CO_2 transport pipeline where it will ultimately be stored in spent oil and gas fields beneath the Irish Sea. We are not the regulator of the geological storage of carbon dioxide. OPRED is the regulator of all CO_2 transport and storage offshore.
Additional information has been provided since the consultation process has ended.	All information received pertaining to the Application is available on the public register and can be provided on request. We do not consider that this additional information affects the effectiveness of the consultation that has been undertaken and we are now consulting on our draft decision.
Concern about Runcorn being the right location	Decisions over land use are matters for the planning system. Location is only a relevant consideration for environmental permitting in terms of assessing environmental impact from emissions on sensitive environmental receptors. This impact has been assessed as described in the main body of this

	document.