Questions & Answers

Drax Bioenergy with Carbon Capture & Storage (BECCS) - Environmental Permit Variation

This document answers questions about the Environment Agency's role in the determination of the environmental permit variation for 'Drax Bioenergy with Carbon Capture and Storage (BECCS), North Yorkshire'.

The following questions were asked during a live, Environment Agency online engagement event on 13th June 2023.

'What guarantees will you require concerning the carbon capture rate? The risk of fugitive (carcinogenic) amines will increase when the power station operates intermittently or if the company is unable to make the carbon capture facility operate as per the design'

We have published guidance on 'Post-combustion carbon dioxide capture: best available techniques (BAT)'. The guidance is available here: https://www.gov.uk/guidance/post-combustion-carbon-dioxide-capture-best-available-techniques-bat

We advise applicants proposing to operate a post combustion carbon capture for geological storage (PCCS) activity to aim to achieve a design carbon dioxide (CO2) capture rate of at least 95% although operationally this can vary, up or down. We expect this to be based on an average performance over an extended period (for example, a year).

In our guidance we state that: '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 CO2 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 application includes commitments to meet this 95% target. The application states: 'The PCC is designed to target the removal of approximately 95% of the carbon dioxide from the flue gas from these two units over the course of their operation (based on 12-month averaging period)' and 'can capture (CO2) during start up and shut down'. See the application documents here: https://consult.environment-agency.gov.uk/psc/y08-8ph-drax-power-limited/

We will review the basis for these statements as part of our determination.

Regarding the risks from releases of carcinogenic substances (nitrosamines) - we will review the applicants risk assessment, including the air dispersion modelling, during the determination. We will consider the applicants assessment of sensitivity of their modelling to relevant factors including foreseeable changes to the modelled emission parameters.

If we grant the variation to the permit, we will issue a varied permit with improvement and/or pre-operational conditions to require validation of the risk assessment for air emissions on which the envelope of assessed impacts is based.

'Is the technology tried and tested? The company's pilot project succeeded on capturing 350kg per day - 70,000 times less than the company proposes in 2030. Should emissions monitoring be even more stringent than proposed, initially until (if ever) the capture facility is operating as per the (highly optimistic) proposal.'

Post combustion carbon capture using amine solvents is an existing industrial technology. For example, we permitted an operational post combustion carbon capture and utilisation plant in Cheshire. This plant uses an amine solvent, monoethanolamine (MEA), to absorb the carbon dioxide.

Also, amine based scrubbing of carbon dioxide from crude oil during production has been used for many years globally. The technology that is proposed in Drax's variation application is similar to that in place at the plant in Cheshire. It is using an amine based solvent to absorb CO2 from the combustion gases. The solvent in this case is not MEA but is a proprietary solvent containing a mixture of amines which the applicant proposes offer performance and environmental benefits over the use of MEA.

The absorption system is similar to existing, commonly used combustion gas abatement technology with staged abatement, to ensure maximum retention of the solvent in the system and to minimise emissions to air.

We will review the proposed technology and techniques to operate during the determination. We will also review the emissions assessment and emissions monitoring proposed by the applicant.

If we grant the variation to the permit, we will issue a varied permit with improvement and/or pre-operational conditions to require validation of the risk assessment for air emissions on which the envelope of assessed impacts is based, and requirements for additional, initial operational monitoring if we think this is relevant.

'What monitoring will be included in the permit if granted?'

The main purpose of monitoring is to show that emissions from the process are not causing harm to the environment.

If we issue a varied permit, we will continue to require monitoring of all relevant parameters required under the BAT for Large Combustion Plant (LCP) as per the current permit.

We will add additional monitoring parameters for relevant amines, and amine breakdown products, appropriate to the emissions from the post combustion carbon capture process.

'Who is responsible for monitoring? Who checks the validity of the monitoring?'

The operator is responsible for the monitoring which must be undertaken to our Monitoring Certification Scheme (MCERTS) standards for monitoring of emissions to air. We will review monitoring results and audit the monitoring techniques as part of our permit compliance checking activities.

'This is a novel solvent - does this make a difference?'

The solvent in this case is a proprietary solvent, containing a mixture of amines, which the applicant proposes offers performance and environmental benefits over the use of MEA. This makes a difference in that there is the potential for higher reactivity of the amines post-release to air with formation of by-products including carcinogenic nitrosamines.

Whether an applicant is proposing to use MEA, or an alternative amine based solvent, for post combustion carbon dioxide capture, we require applicants to follow our published guidance on air emissions risk assessment and air dispersion modelling reports:

Air emissions risk assessment: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

Air dispersion monitoring reports: https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports

In addition, our online guidance on post combustion carbon dioxide capture: best available techniques (BAT) includes a link to the BAT review including our recommendations for the assessment and regulation of impacts to air quality from amine-based post-combustion carbon capture plants.

Our guidance requires applicants to assess risks from direct emissions of amines and breakdown products from the PCC scrubbing system, as well as indirect emissions from atmospheric reactions of the emitted amines.

For this application, the applicant has used the software package which we developed to assess emissions of amines to air. We will review the operator's assessment during our determination.

If we grant the variation to the permit, we will issue a varied permit with improvement and/or pre-operational conditions to require validation of the risk assessment for air emissions on which the envelope of assessed impacts is based.

'I emailed a question about some of the documents not opening properly - I have not yet received an answer - several of the MSWord docs create email messages without being readable.'

We believe this was a temporary issue between 5pm on 5th June and midday on 6th June. All documents, including emails, are now accessible.

'Pls clarify the purpose of this consultation if Beis has already done a review. Should you coordinate with Beis? Have you done the same for other CCUS projects?'

We are required by the Environmental Permitting Regulations to consult on certain types of applications with other organisations and the public. The consultation is to enable members of the public and other interested parties to review and comment on the proposals in the application. In this case we are seeking your views on Drax's proposals to add a carbon capture activity to their permit.

When we decide an application is of high public interest, we tailor our consultation to the particular circumstances. We consider this application of high public interest (HPI) and have publicised more widely. Where we have received substantial variations from other operators to include a carbon capture activity in their permits, we have consulted in the same way as for Drax.

This consultation is on the environmental permit application only and the government is not involved. We will make our decision based on the proposals in the application taking into account any relevant comments made during the consultation.

Government consultations, such as those carried out by the Department for Energy Security and Net Zero (formerly BEIS), are generally focused on the development of government policy. Environment Agency consultations are focused on individual environmental permit applications and are therefore separate from government.

'If the capture storage will reduce carbon dioxide emissions, will there also be a reduction in the harmful particle emissions?'

The operator is still required to meet the conditions in the current permit including meeting the emission limits set in the permit, including that for particulate emissions.

There may be some reduction in particulate emissions as the process to capture the carbon dioxide from the flue gases from the power station is a wet process, so some particulates will be removed in that process.

In addition, it's also important that there are low levels of particulates when the flue gas enters the carbon capture plant, so that the capture solvents do not become contaminated.