



**Variation to Operate Carbon Capture and  
Directly Associated Activities to on Unit 2  
and/or Unit 1 at Drax Power Station  
(VP3530LS) Non-Technical Summary**

## 1. Non-technical Summary

The history of Drax Power Station is very much enshrined in utilisation of fossil fuels, but as a company Drax has recognised and put the climate challenge at the centre of the site's transformation. This led to the largest fossil fuelled generator in the United Kingdom becoming the largest single site renewable generator, a transformation that remains Europe's largest single site decarbonisation project and that was significant in scale, both technologically and environmentally.

Once again Drax and the Drax Power Station are standing on the precipice of change. A change with the goal to start indirectly sequestering carbon dioxide through use of sustainable forestry from the biosphere, when coupled with the carbon dioxide transportation and storage facilities also being developed.

This aligns with the UK Government's 'The Ten Point Plan for a Green Industrial Revolution', point 8 of which supports the investment in carbon capture, usage and storage which targets the capture of 10Mt of carbon dioxide per year by 2030. This work has commenced with the announcement of the first two carbon capture clusters, one of which, the East Coast Cluster, is in the locality of Drax Power Station. Separately the UK Government has an ambition to achieve 5Mt of engineered carbon dioxide removals by 2030.

This UK Government's direction is influenced by the independent Climate Change Committee (CCC) in its capacity as adviser to the UK and devolved administration on emissions targets. The CCC's Sixth Carbon Budget supports the utilisation of bioenergy with carbon dioxide capture, as a significant contributor to the greenhouse gas removals sector.

Aligned to this policy intent, Drax is seeking a variation to its environmental permit for Drax Power Station to retrofit and operate post-combustion carbon dioxide capture as an activity on up to two of our current biomass fuelled generating units. This would enable the capture of over approximately 8 million tonnes of carbon dioxide per annum from sustainable biomass sources, the largest bioenergy carbon capture project at any material stage of development in the UK. Drax is planning to transport and store carbon dioxide captured by the post-combustion carbon dioxide capture (PCC) system via the East Coast Cluster.

The technology that has been selected to enable Drax to take this step is being developed around industry leading amine-based carbon capture processes, the Kansai Mitsubishi Carbon Dioxide Recovery Process (KM-CDR<sup>®</sup>) process, utilising the very latest in amine solvents, namely KS21<sup>™</sup> solvent. This package of technology and solvent was selected following an internal assessment which found it to be the best technology available in terms of efficiency, capture and environmental performance.

In terms of environmental performance, the assessments Drax has undertaken clearly indicate that air emissions released from the operation of the process should not have any significant impact on human or ecological receptors at the proposed operating limits. In addition, the discharges to water in terms of quality and quantity are not expected to deteriorate.

Engineering design has optimised heat and electrical demand from the process without reducing capture efficiency or solvent life cycle. The water cycle of the site and the process have been integrated to optimise utilisation of this key resource within the process with the aim of optimising our abstraction requirements.

In our view the KM-CDR process together with the associated KS21™ solvent is the best available carbon capture technique. This, coupled with the integrated engineering ethos that has been applied to the retrofit post-combustion carbon dioxide capture at Drax Power Station. This will ensure that the proposed technological solution applied to our existing host units will be done in the most energy and resource efficient way available within the physical and engineering constraints of the existing site.

The variation application for Drax Power Station is seeking permission for the following alterations:

***Changes to or additions of schedule 1 activities***

<i>Environmental Permitting Schedule 1 reference</i>	Description of activity	Installation, undertakings, and modifications associated with the activity
<i>6.10 Part A(1)(a)</i>	Capture of carbon dioxide streams from an installation for the purposes of geological storage	<ul style="list-style-type: none"> <li>• Alterations and extension of flue gas pipework from combustion activity.</li> <li>• Installation of gas/gas heater.</li> <li>• Installation of flue gas desulphurisation and direct contact cooler (Quencher) on PCC units.</li> <li>• Installation of absorber towers, including post water and acid wash sections and associated regenerator towers and infrastructure.</li> <li>• Installation of solvent reclaim facilities.</li> <li>• Installation of associated chemical storage and distribution for the PCC.</li> <li>• Installation of waste solvent storage and removal facilities</li> <li>• Installation of heat exchanger infrastructure for the purpose of cooling and heat integration.</li> <li>• Installation of carbon dioxide dehydration and low-pressure compression.</li> <li>• Installation of carbon dioxide transportation pipework.</li> <li>• Installation of high-pressure compression system with associated vent tower.</li> <li>• Installation of new monitoring facilities and instrumentation.</li> <li>• Installation of control monitoring equipment and systems.</li> <li>• Modification of cooling water system to provide cooling water to PCC activity directly.</li> </ul>
<i>1.1 Part A(1)(a)</i>	Burning any fuel in an appliance with a rated thermal input of 50 or megawatts.	<ul style="list-style-type: none"> <li>• Modification of units 5 &amp; 6 flue gas layout and abatement during construction phase.</li> <li>• Removal of Ouse Renewable Energy plant which is no longer required as the project will not be progressed.</li> </ul>
<i>4.2 Part A(1)(a)(iv)</i>	Producing inorganic chemicals such as salts	<ul style="list-style-type: none"> <li>• Cessation of and demolition of current salt production facilities associate with flue gas desulphurisation (FGD).</li> </ul>

		<ul style="list-style-type: none"> <li>• Installation of new ammonia treatment facility for quencher wastewater treatment, producing ammonium sulphate.</li> </ul>
5.4 Part A(1)(a)(ii)	Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day involving one or more of the following the defined activities	<ul style="list-style-type: none"> <li>• Cessation of operation and demolition of current flue gas desulphurisation water treatment plant.</li> <li>• Installation of new wastewater treatment plant for PCC flue gas desulphurisation and direct contact cooler (Quencher)</li> </ul>
<i>Changes to current operating techniques</i>		
NA	Ash handling and storage	<ul style="list-style-type: none"> <li>• Changes to current Furnace Bottom Ash (FBA) receipt and management infrastructure and handling systems</li> </ul>

## 2. Project Overview

The post-combustion capture involves the installation of post-combustion carbon dioxide capture (PCC) technology to capture carbon dioxide from up to two of the existing 660 megawatt electrical ('MWe') permitted biomass power generating units at the Drax Power Station (planned to be Unit 1 and Unit 2) ("the New Activity").

The installation of the PCC technology is a separately identified activity under the Environmental Permitting (England and Wales) Regulations 2016 and is separate although directly linked to the host combustion activity of biomass Units 1 and 2. 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).

Drax is therefore seeking a variation to its existing environmental permit for Drax Power Station under the Environmental Permitting (England and Wales) Regulations 2016, to enable it to operate the New Activity ("the Variation Application"). This document sets out information required to enable the Environment Agency (EA) to consider the Variation Application.

The New Activity is a novel and complex installation. The EA has indicated that it accepts that the New Activity falls under that description and that it is, in principle, therefore willing to accept a staged Variation Application being made, consistent with paragraph 5.15 of the EA's Environmental Permitting: Core Guidance for the Environmental Permitting (England and Wales) Regulations 2016. The proposed approach to the staged application, including timescales for providing further information, is set out in Section.

It should be noted that the Project is the subject of an application for a development consent order (DCO) under the Planning Act 2008, and the information in this Variation Application is consistent with the information provided in support of the DCO application.

The carbon dioxide captured will undergo processing and compression before being transferred to the operator of a carbon dioxide pipeline (expected to be National Grid Carbon Limited) for onward transportation and subsequent storage. This interface is critical, and the future rules and requirements attributed to this carbon dioxide transport network will have direct implications for the operations of the PCC activity.

It is intended that core items of the existing infrastructure at the Drax Power Station will be re-used by installing and integrating the Carbon Capture Plant with existing infrastructure including existing power generating units (Units 1 and 2) for extraction of steam, and re-using the cooling water systems, Main Stack and electrical connections where feasible.

The New Activity will involve the installation and operation of up to two Carbon Capture Plants (one associated with Unit 1 and one associated with Unit 2) each consisting of:-

- Flue gas pre-treatment (quench column)
- One Absorber Column
- Solvent Regeneration Systems (two regenerator units)
- Rich Solvent / Lean Solvent Heat Exchangers

Additional common plant infrastructure and modification works to the Drax Power Station that are required to support and integrate with one or both Carbon Capture Plants include:-

- Solvent Storage and Make-up System
- Carbon Capture Wastewater Treatment Plant
- Carbon Dioxide Processing and Compression Plant
- Modification of the existing cooling system and distribution of cooling water to the PCC
- Modifications to existing power generating units for steam extraction and new steam processing infrastructure for distribution of process steam and electricity supply to the PCC including combined heat and power train for each PCC system
- Alterations to the surface water collection infrastructure to enable utilisation of the resource
- Upgrades to the existing electrical infrastructure and new electrical infrastructure for the secondary electrical supply to the PCC

The captured carbon dioxide would ultimately be transported via new National Grid Transport and Storage Infrastructure for permanent storage in naturally occurring aquifers under the North Sea. This infrastructure would be developed by National Grid Carbon Limited.

The process block flow diagram showing a schematic layout of the PCC system is provide in **Diagram 1**. This is an illustrative schematic only to provide an indication of the systems and there a various interfaces and interactions.

**Diagram 1 – Process Block Flow Diagram for Post-combustion Carbon Capture System**

