
Need Case

The Yorkshire and Humber (CCS Cross Country Pipeline) Development Consent Order

*Under Regulation 5(2)(q) of the Infrastructure Planning
(Applications: Prescribed Forms and Procedure)
Regulations 2009*

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ACROYNMS

Carbon Capture and Storage	CCS
Capture Power Limited	CPL
Contract for Difference	CfD
Department of Energy and Climate Change	DECC
Development Consent Order	DCO
Don Valley Power Project	DVPP
Electricity Market Reform	EMR
Emissions Trading System	EU ETS
European Commission	EC
European Energy Programme for Recovery	EEPR
European Union	EU
Financial Investment Decision	FID
Front End Engineering and Design	FEED
Global Greenhouse Gas	GHG
Intergovernmental Panel on Climate Change	IPCC
International Energy Agency	IEA
Million tonnes	Mt
Million tonnes per year	Mt/y
Nationally Significant Infrastructure Project	NSIP
National Policy Statement	NPS
Pipeline Inspection / Internal Gauge	PIG
Planning Inspectorate	PINs
United Kingdom	UK

Executive Summary

The proposed Cross Country pipeline and associated infrastructure described in this Application for Development Consent is necessary to enable Carbon Dioxide to be transported from Drax (near Selby, North Yorkshire) and eventually other power stations (or other emitters of Carbon Dioxide) in the Yorkshire and Humber region. After transportation the Carbon Dioxide will be safely stored in porous rock formations beneath the North Sea.

Carbon Capture and Storage (CCS) offers a means to prevent large emissions to atmosphere of the greenhouse gas Carbon Dioxide from Coal and Gas fired power stations.

This Need Case for the Yorkshire and Humber CCS Cross Country Pipeline demonstrates that there is a need and that the need is urgent. In doing so the Need Case reminds the reader of the threat posed by Global Warming and summarises the UK government's main policy responses that are pertinent to CCS and this scheme. This Need Case highlights that National Policy Statement EN-1 plays a significant role in supporting the need for this scheme as a means of furthering government policy in combatting climate change.

The Need Case describes;

- The Onshore Scheme and its interaction with offshore transportation in order to complete the whole transportation chain.
- The large potential to apply Carbon Capture across multiple emitters across the Yorkshire and Humber region.
- The role of the White Rose CCS project as the anchor scheme with a number of other follow on loads in preparation.
- High level design considerations for the Transportation and storage scheme.

The Need Case confirms that the project is necessary and urgent. National Grid is committed to the development of Transportation and Storage in its role as a member of the White Rose CCS Project and confirms that the project is part of the UK Governments CCS Commercialisation programme.

1 Introduction

- 1.1 This document, produced by National Grid Carbon Limited (referred to in this report as “National Grid”), has been prepared to inform the public, statutory consultees and other stakeholders of the need for the construction of a Cross Country Pipeline and associated infrastructure as part of the development of Carbon Capture and Storage (CCS) infrastructure in the Yorkshire and Humber region.
- 1.2 National Grid proposes to construct a pipeline transportation and storage system to support the provision of CCS technology in the Yorkshire and Humber Region. The first power station to be connected to the transportation and storage system would be a proposed new development at Drax power station near Selby, North Yorkshire. The power station development is known as the White Rose CCS Project, promoted by Capture Power Limited (“Capture Power”) and will be the subject of a separate application to the Planning Inspectorate (PINS).
- 1.3 On 20th March 2013, the UK Government (the Department of Energy and Climate Change (DECC)) announced that it had selected the White Rose CCS Project for funding under the United Kingdom (UK) CCS Commercialisation Programme (“the Programme”) (Ref 1). The first stage of the Programme, which includes Front End Engineering and Design (FEED) and major consenting activities are planned to be completed during 2015.
- 1.4 The onshore transportation infrastructure (which is the subject of this Development Consent Application) is a component of the White Rose CCS Project and is categorised as a Nationally Significant Infrastructure Project (NSIP) pursuant to the Planning Act 2008 (“the Act”). This application has been made for a Development Consent Order (DCO) to the Planning Inspectorate (PINS) who in turn will make a recommendation to the Secretary of State (SoS) for Energy and Climate Change on whether to grant Development Consent.
- 1.5 It is necessary to obtain a DCO in 2015. This is to enable National Grid, Capture Power and the UK Government (DECC) to make a Final Investment Decision (FID) in late 2015 or early 2016 whether to proceed through to construction and operation for the White Rose CCS Project. An absence of a DCO would present a considerable risk for the decision

makers with regard to understanding the viability of the White Rose CCS Project.

- 1.6 The Overarching National Policy Statement for Energy (EN-1) (Ref 2) is part of a suite of National Policy Statements (NPS) laid before Parliament for approval by the SoS for Energy and Climate Change. This NPS (EN-1) approved by Parliament (18th July 2011) makes specific reference to CCS, stating that:

"The Government is leading the international efforts to develop CCS. This includes supporting the cost of four commercial scale demonstration projects at UK power stations. The intention is that each of the projects will demonstrate the full chain of CCS involving the capture, transportation and storage of carbon dioxide in the UK. These demonstration projects are therefore a priority for UK energy policy. The demonstration programme will also require the construction of essential infrastructure (such as pipelines and storage sites) that are sized and located both for the purpose of the demonstration programme and to take account of future demand beyond the demonstration phase. The IPC [now PINS] should take account of the importance the Government places on demonstrating CCS, and the potential deployment of this technology beyond the demonstration stage, in considering applications for consent of CCS projects and associated infrastructure."

- 1.7 The SoS is obliged to determine applications in accordance with the prevailing NPS.
- 1.8 This document describes the scheme that is the subject of this application. It is not intended to duplicate the technical specifications or the preferred siting options, as these aspects are covered separately in other National Grid application documents and information materials relating to the Yorkshire and Humber CCS Transportation and Storage Project, and which can be found on the National Grid website: www.cshumber.co.uk
- 1.9 This document also explains why CCS is an important tool in abating climate change, and why the Yorkshire and Humber region offers great potential for additional demand to use the transportation and storage infrastructure. As the NPS expects, National Grid proposes to future proof the Pipeline (providing more capacity than is necessary for the initial demand from the White Rose CCS Project) so as to provide a location to connect future loads and make provision for increasing pumping capacity to address this anticipated future demand in accordance with government policy.

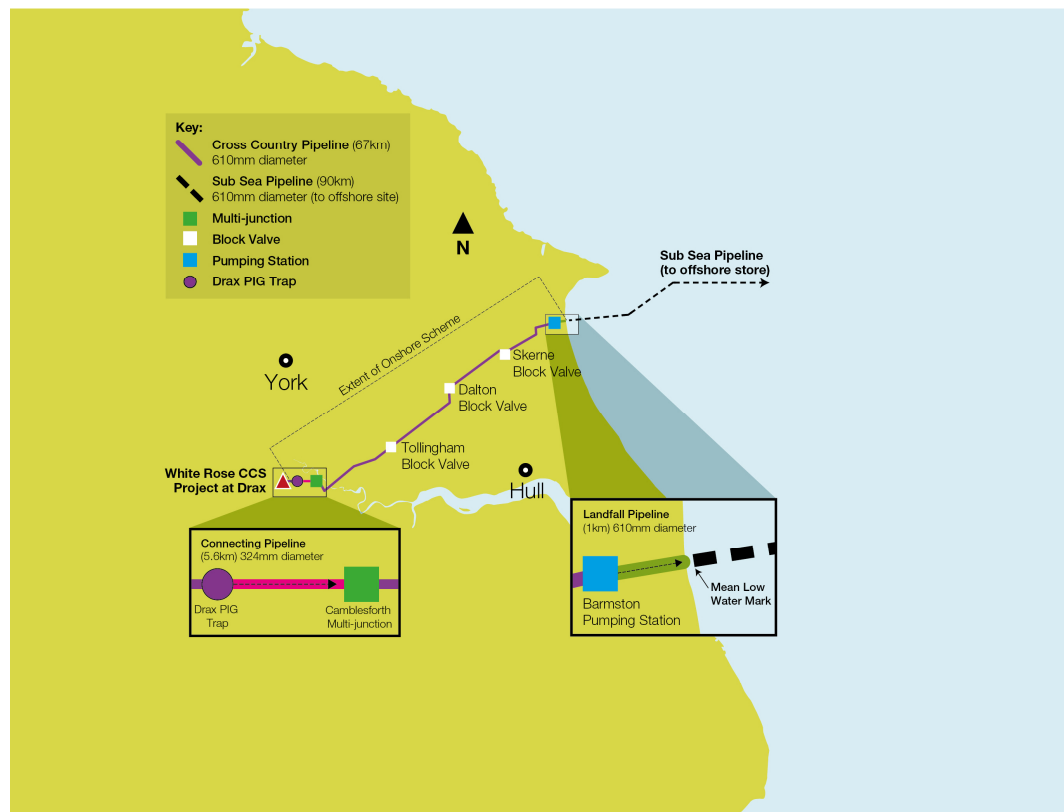
2 About National Grid Carbon Limited

- 2.1 National Grid plc is an internationally recognised leader in the safe development and operation of large capacity, multi-user, energy transmission systems. In the UK, National Grid plc owns and operates the electricity and natural gas transmission infrastructure at the centre of Britain's energy system and in the North Eastern states of North America, National Grid provides natural gas and electricity directly to millions of customers. National Grid Gas runs Britain's high pressure natural gas transmission system as well as four of its eight gas distribution networks, delivering gas to 11 million homes and businesses. National Grid Electricity Transmission runs Britain's electricity transmission system. National Grid plc also owns and operates a number of other energy related business in the UK, including Liquefied Natural Gas importation facilities.
- 2.2 National Grid Carbon Limited (referred to as 'National Grid' as opposed to 'National Grid plc' in this document) is a wholly owned subsidiary of National Grid plc engaged in the development of Carbon Dioxide transportation and storage infrastructure in the UK as part of the emerging CCS industry. National Grid wishes to draw on its wider group experience to develop such infrastructure as multi-user systems in the most efficient manner possible and in a way that supports the growth of the CCS industry in the UK.

3 Project Description

- 3.1 The Project is a proposed Carbon Dioxide Transportation and Storage system to support the provision of CCS technology in the Yorkshire and Humber Region. The Project in its entirety, known as The *Yorkshire and Humber CCS Transportation and Storage Project* (“the Project”), would comprise the construction of a Cross Country Pipeline and sub-sea Pipeline for transporting Carbon Dioxide captured from power projects in the region to a permanent geological storage site beneath the North Sea. The Project includes both onshore and offshore elements which are subject to separate consenting regimes (the “Onshore Scheme” and the “Offshore Scheme” respectively).
- 3.2 The Offshore Scheme currently comprises the construction of a 90 kilometre sub-sea Pipeline and geological storage site which would be subject to an authorisation by the Secretary of State for Energy and Climate Change in accordance with the Petroleum Act 1998 (Ref 3) and the Energy Act 2008 (Ref 4) respectively.
- 3.3 The Onshore elements of the Project are collectively termed the Yorkshire and Humber CCS Cross Country Pipeline (shortened to the “Onshore Scheme”). The subject of this application is the Onshore Scheme and this is proposed to comprise the construction of a Cross Country Pipeline and associated infrastructure including Pipeline Inspection Gauge (PIG) Traps, a Multi-junction, three Block Valves, a Pumping Station (collectively termed “Above Ground Installations” or “AGIs”) and any necessary interconnecting local pipelines and associated works. The Pumping Station will boost pressures prior to driving the Carbon Dioxide into the Offshore Pipeline. These are illustrated on the ‘High Level Schematic’ below.

Schematic of the Onshore Scheme



3.4 The Onshore Scheme includes:

- An approximately 67 kilometre section (the 'Cross Country Pipeline') from the Multi-junction (south of Drax) to the Pumping Station (up to 610mm nominal diameter).
- A 'local' Pipeline to connect the White Rose CCS Project to the Multi-junction (324mm diameter and 5.6 kilometres in length).
- A 'local' Pipeline between the Pumping Station and Mean Low Water Mark (up to 610mm diameter and 1.125 kilometres in length)
- A 'local' Pipeline between the Gas Processing Unit at the proposed White Rose CCS Power Station and the proposed Drax PIG Trap (324mm diameter and up to 0.5 kilometres in length).

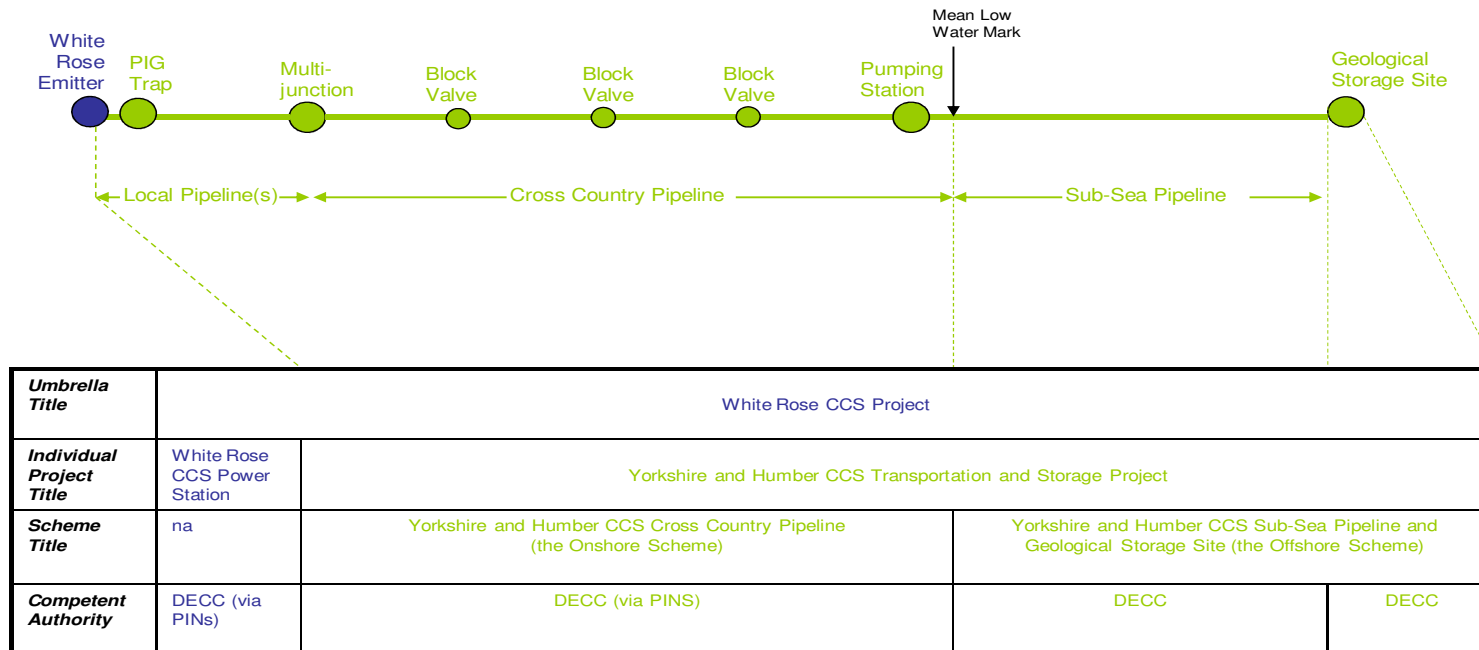
3.5 The associated AGIs include:

- Camblesforth Multi-junction. The Multi-junction will provide facilities for the future connection of new loads (and new pipelines) to the Cross Country Pipeline.
- Tollingham Block Valve to the south east of Holme-upon-Spalding-Moor and to the west of Holme Industrial Estate at the former Royal Air Force Holme-on-Spalding-Moor airfield near Tollingham.
- Dalton Block Valve to the south west of Lund.
- Skerne Block Valve is to the south east of Skerne.

- The Barmston Pumping Station which is located near the coast to the north of Barmston and the south of Fraisthorpe. Infrastructure constructed at the Barmston Pumping Station will be progressively increased as new loads are connected. This application includes the maximum land take for the installation and describes the maximum apparatus needed on the site.
- 3.6 As the length of the proposed Cross Country Pipeline will exceed 16.093 kilometres it constitutes a NSIP pursuant to the Act (Ref 5). This requires an application to be made to PINS for a DCO.
- 3.7 The Cross Country Pipeline will have a diameter of up to 610mm and will be sized to accommodate up to 17 million tonnes of Carbon Dioxide emissions per year (Mt/y). The Multi-junction would enable the connection of multiple pipelines from regional Carbon Dioxide emitters to the Project. At present one installation for the capture of Carbon Dioxide streams, the White Rose CCS Project adjacent to Drax Power Station at Selby, being promoted by Capture Power, would require a pipeline connection into the Cross Country Pipeline. An interconnecting Pipeline between the White Rose CCS Project and the Multi-junction will form part of the DCO application for the Onshore Scheme.
- 3.8 PIG traps would be sited at the start and end of each pipeline to launch PIGs. These facilities are required to support the periodic inspection of pipelines as part of National Grid's planned pipeline inspection and maintenance programme.
- 3.9 The sub-sea Pipeline will have a diameter of up to 610mm and would be sized to accommodate up to 17 Mt/y. The geological storage site presently proposed would comprise the permanent storage of captured Carbon Dioxide in a saline aquifer located approximately 1,000 metres below the seabed. National Grid has been granted an agreement to lease an area of the storage site designated as 5/42 in the southern North Sea for the purpose of geological storage of Carbon Dioxide. The capacity of the storage site is subject to on-going investigations but it is expected to accommodate at least 200 Million tonnes (Mt) of captured Carbon Dioxide. It is anticipated that once this site has reached capacity further storage sites would be identified and utilised.
- 3.10 The Onshore and Offshore Schemes would be joined at the Mean Low Water Mark using appropriate landfall techniques; this is also the juncture of the onshore and offshore consenting regimes.

3.11 The relationship between the respective Schemes, the White Rose CCS Project and respective competent authorities is illustrated on Figure 1 below.

FIGURE 1: Yorkshire and Humber CCS Cross Country Pipeline Interface Diagram



4 The Need for Carbon Capture and Storage

- 4.1 The Intergovernmental Panel on Climate Change (IPCC) issued its 5th Assessment Report in September 2013 (ref 6) That report stated,

“Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased.

Each of the last three decades has been successively warmer at the Earth’s surface than any preceding decade since 1850. In the Northern Hemisphere, 1983–2012 was Likely the warmest 30-year period of the last 1400 years.

Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010 (high confidence). It is virtually certain that the upper ocean (0–700 m) warmed from 1971 to 2010, and it likely warmed between the 1870s and 1971.

The atmospheric concentrations of carbon dioxide (CO₂), methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. CO₂ concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. The ocean has absorbed about 30% of the emitted anthropogenic CO₂, causing ocean acidification”.

- 4.2 A major source of Carbon Dioxide emissions into the atmosphere is the burning of fossil fuels (coal, oil and gas) in power stations for electricity production, accounting for 40% of global energy-related Carbon Dioxide emissions. This is known as anthropogenic Carbon Dioxide.
- 4.3 The scientific basis for anthropogenic Carbon Dioxide production and consequent climate change is well established. According to the IPCC, global greenhouse gas (GHG) emissions must be reduced by 50 to 80 per cent by 2050 to avoid dramatic consequences of global warming.
- 4.4 CCS is a technology with potential for large reductions in Carbon Dioxide emissions. The International Energy Agency (IEA) has argued that “As long

as fossil fuels and carbon-intensive industries play dominant roles in our economies, CCS will remain a critical greenhouse gas reduction solution". It also added that "IEA analysis shows that CCS is an integral part of any lowest-cost mitigation scenario where long-term global average temperature increases are limited to significantly less than 4 °C, particularly for 2 °C scenarios." (Ref 7)

- 4.5 The European Union (EU), which is responsible for around 11% of global GHG emissions today, has put in place binding legislation to reduce its emissions to 20% below 1990 levels by 2020. Europe is also offering to scale up this reduction to 30% if other major economies in the developed and developing worlds agree to undertake their fair share of a global reduction effort. For the longer term, the EU has committed to cut its emissions to 80-95% below 1990 levels by 2050, as part of the action that will be required from the developed world. In March 2011, the European Commission published "A Roadmap for moving to a competitive low carbon economy in 2050" (Ref 8) that charts a cost effective pathway for making the transition to the competitive, low carbon European economy that this significant reduction will require. Research and development into CCS and demonstration and early deployment are of paramount importance to ensure its safe, cost-effective and large-scale application. (Ref 9).
- 4.6 In support of these commitments the EU introduced the Emissions Trading System, also known as the European Union Emissions Trading Scheme (EU ETS). Launched in 2005 it was the first large emissions trading scheme in the world and remains the biggest. EU ETS enables an upper limit to be set on the total amount of certain greenhouse gases, including Carbon Dioxide, which can be emitted by the factories, power plants and other installations in the European system. The cap is reduced over time so that total emissions fall.
- 4.7 The Climate Change Act was passed in 2008 and established a framework to develop an economically credible emissions reduction path. A timeline of UK climate change policies leading up to the introduction of the 2008 Climate Change Act is provided in appendix 1.
- 4.8 The UK Government has a policy to increase the use of low carbon technologies including CCS. The Government has stated that; *"CCS is the only way we can reduce carbon dioxide emissions and keep fossil fuels (coal and gas) in the UK's electricity supply mix. Fossil fuels are an important part of the electricity mix (and will remain so for some time to come) because they let us balance the intermittency of wind and the inflexibility of nuclear.*

If developed at scale CCS could:

- *allow the safe removal and permanent storage of carbon dioxide emissions from coal and gas power stations*
- *remove and permanently store emissions from large industrial sources such as steel or cement factories” (Ref 10)*

4.9 In support of this policy, the Government has established:

- A £1 billion commercialisation competition of which the infrastructure proposed by the White Rose CCS Project (including the Onshore Scheme) is a potential beneficiary (Ref 11).
- A £125 million, 4-year co-ordinated research, development and innovation programme which is intended to have an important role in reducing the costs of CCS, by developing cheaper and more efficient technologies and components, and contribute to characterising storage sites (Ref 12).
- Reform of the UK electricity market so CCS will be able to compete with other low-carbon energy sources. In May 2012, DECC set out its vision of the requirements for Electricity Market Reform (EMR) (Ref 13).
- A Cost Reduction Task Force to advise the government and industry on the steps needed to reduce the cost of CCS, so it can compete with other low carbon technologies. (Ref 14).

4.10 In DECCs response to the Cost Reduction Task Force (Ref 15) it confirmed that; *“Development of CCS could benefit from a planning and consenting framework that has an assumption that CCS will be needed, rather than that CCS might be needed”.*

5 Need for CCS recognised in National Policy Statement EN-1

- 5.1 The Overarching National Policy Statement for Energy (EN-1) was approved by Parliament (18th July 2011) and makes specific reference to CCS, stating that:

"To meet emissions targets, dependency on unabated fossil fuel generation stations must be reduced. To help achieve this reduction but maintain security of supply, it is necessary to reduce carbon emissions, particularly from coal-fired generating stations. Carbon Capture and Storage (CCS) has the potential to reduce carbon emissions by up to 90%."

- 5.2 The NPS recognises that:

"A number of fossil fuel generating stations will have to close by the end of 2015. Although this capacity may be replaced by new nuclear and renewable generating capacity in due course, it is clear that these must be some fossil fuel generating capacity to provide back-up for when generation from intermittent renewable generating capacity is low and to help with the transition to low carbon electricity generation. It is important that such fossil fuel generating capacity should become low carbon, through development of CCS, in line with carbon reduction targets. Therefore there is a need for CCS fossil fuel generating stations and the need for the CCS demonstration projects is urgent"

- 5.3 With regard to transportation:

"The most likely method for transporting the captured carbon dioxide is through pipelines. These will be located both onshore and offshore. There are currently no carbon dioxide pipelines in the UK and considerable future investment in pipelines will be required for the purpose of the demonstration programme. If CCS is deployed more widely, it is likely that these initial investments could form the basis of a wider carbon dioxide pipeline network, which is likely to require greater capacity pipelines. In considering applications the IPC should therefore take into account that the Government wants developers to bear in mind foreseeable future developments when considering the size and route of their investments and may therefore propose a pipeline with a greater capacity than necessary for the project alone."

5.4 The NPS also recognises that:

"The Government is leading the international efforts to develop CCS. This includes supporting the cost of four commercial scale demonstration projects at UK power stations. The intention is that each of the projects will demonstrate the full chain of CCS involving the capture, transportation and storage of carbon dioxide in the UK. These demonstration projects are therefore a priority for UK energy policy. The demonstration programme will also require the construction of essential infrastructure (such as pipelines and storage sites) that are sized and located both for the purpose of the demonstration programme and to take account of future demand beyond the demonstration phase. The IPC should take account of the importance the Government places on demonstrating CCS, and the potential deployment of this technology beyond the demonstration stage, in considering applications for consent of CCS projects and associated infrastructure."

6 Potential Carbon Dioxide Abatement in Yorkshire and Humber

- 6.1 National Grid believes that the Yorkshire and Humber region offer the best potential to develop a cluster of power stations and industrial enterprises that are all using carbon capture technologies. The close proximity to each other of such plant affords the ability to make greater use of shared transportation and storage infrastructure. The use of transportation 'networks' and storage sites by multiple emitters offers the potential to obtain economies of scale and ultimately transport and store Carbon Dioxide at lower unit costs. This is a vital component in making CCS an attractively priced option compared to other carbon abatement technologies.
- 6.2 The regional economy has historically been based on heavy industry, coal mining and energy generation. The Yorkshire and Humber region is the location of the largest cluster of Carbon Dioxide industrial emitters in the UK including a number of the UK's 50 largest emitters (Ref 16). The region produces around 90 Mt of Carbon Dioxide emissions annually (Ref 17) with more than 45 Mt/y released from sources including fossil fuel power stations, oil and gas refineries and industrial processes. Together these represented approximately 10% of the UK's Carbon Dioxide emissions in 2009.
- 6.3 Over five million people live within the Yorkshire and Humber region with some 270,000 businesses contributing to an economy worth over £80 billion per annum.(Ref 18)
- 6.4 The Yorkshire and Humber region contains some of the largest emitters of Carbon Dioxide in the UK. These emitters are located in two principal clusters: the Aire Valley and the South Humber Bank. The Aire Valley emitters include the coal fired power stations of Drax, Eggborough and Ferrybridge. The South Humber Bank emitters include Tata Steel, and various power stations and refineries adjacent to the Humber Estuary.
- 6.5 The major sources of Carbon Dioxide in the region are illustrated in Table 1 and Figure 6.1 below.

Table 1 Major Emitters in the Yorkshire and Humber Region		
Facility	Activity	Carbon Dioxide Emissions/y (2009¹)
Drax	Power Station	19.9 Mt/y
Eggborough	Power Station	5.5 Mt/y
Tata Steel (formerly the Corus Steel Works)	Integrated Iron and Steel Works	5.1 Mt/y
Ferrybridge 'C'	Power Station	4.0 Mt/y
Saltend Cogen	Power Station	3.4Mt/y
South Humber Bank	Power Station	3.3Mt/y
Immingham	Combined Heat and Power Station	2.9Mt/y
Killingholme 'A' and 'B'	Power Station	3.5 Mt/y
Humber Refinery	Oil Refinery	1.8Mt/y
Keadby	Power Station	1.5 Mt/y
Lindsey Refinery	Oil Refinery	1.4Mt/y
Brigg	Power Station	0.5Mt/y

6.6 The region's contribution to Carbon Dioxide reduction is likely to be crucial in achieving the UK's target of an 80% cut in Carbon Dioxide emissions². This is reflected in the region's designation as the UK's first Low Carbon Economic Area for CCS.

6.7 Most of the Yorkshire and Humber Carbon Dioxide point source emission sources are located relatively close to the North Sea coast. The target storage site is a relatively short distance offshore. Taken together the close proximity between emitter and store reduces the cost of transport and provides a further compelling reason for developing CCS in the Yorkshire and Humber region. In 2008, Yorkshire Forward, the then Regional Development Agency for the region has stated that:

¹ Based on data from the World ETS Database, a comprehensive analytical tool incorporating all mandatory carbon trading schemes around the world, including the EU ETS Companies Database.

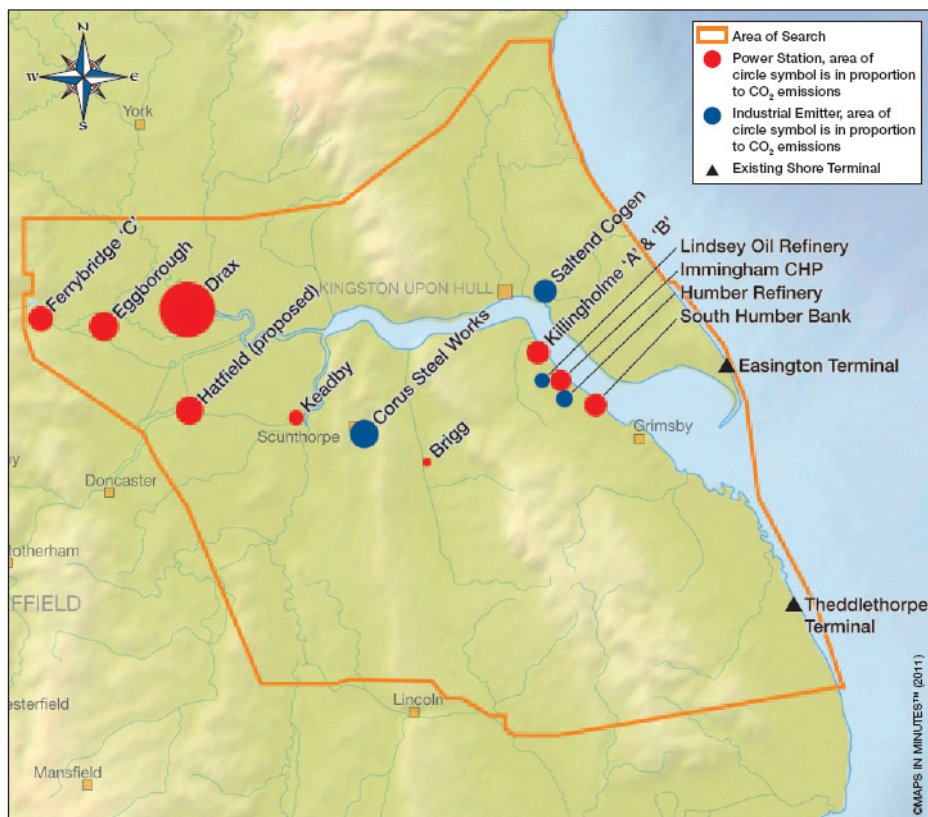
² The UK's Climate Change Act (2008) set a target of reducing greenhouse gas emissions by 80 per cent by 2050, with an interim target for CO₂ reduction of at least 26 per cent by 2020.

“As a region we are ideally placed to become a world-renowned CCS location on the basis of the unique geographic and industrial assets, with the UK’s largest cluster of industrial Carbon Dioxide emissions with proximity to major Carbon Dioxide stores. These assets leave us well placed to demonstrate and rapidly deploy CCS on a scale that can be matched by few others worldwide.” (Ref 19)

It is estimated that construction of a Carbon Dioxide transport network serving all of the major emitters in the region could bring 55,000 jobs and £2bn investment. It could also play a key role in helping the UK meet its climate change targets, preventing around 60 Million tonnes of Carbon Dioxide from entering the atmosphere annually.

- 6.8 CCS has the potential to provide a means by which traditional forms of heavy industry, which provide employment, can operate sustainably into the foreseeable future.

Figure 6.1: Location of Major Emitters in the Yorkshire and Humber Region



- 6.9 The inclusion of a Multi-junction, located near Drax, as part of the Onshore Scheme allows future pipelines transporting Carbon Dioxide from other regional emitters to connect to the Cross Country Pipeline over time. It is

anticipated that the Multi-junction would act as a 'hub' for the development of an onshore regional CCS Pipeline network.

6.10 The Multi-junction can act as a catalyst for efficient growth of a commercially competitive CCS industry in the Yorkshire and Humber region. This approach is supported by the conclusions of the UK Carbon Capture and Storage Cost Reduction Task Force's Final Report on 'The Potential for Reducing The Costs of CCS in the UK' (Ref 13) which recognises that early projects should take into account the likely future requirements for Carbon Dioxide transportation infrastructure to minimise long-run average costs. It further reports that the lowest cost transportation networks will be the ones that minimise the need for building additional pipelines that would incur significant costs. The Multi-junction is positioned in a logical location to achieve this efficiency:

- It is located to the south and west of the River Ouse and Humber Estuary so that future connections should not have the need to incur the costs and disruption associated with constructing a river crossing.
- It is well positioned to keep the length of connecting pipelines from the more heavily industrialised areas of north Lincolnshire, South Yorkshire and West Yorkshire to a minimum.

6.11 DECC expressed support for this approach in its document "Government response to the CCS Cost Reduction Task Force" (published on 16 October 2013 Ref 14). In that document DECC stated that:

"we specifically welcomed projects with clustering potential to bid in our CCS Commercialisation Competition. For example one of our preferred bids, the White Rose project, is located in the Yorkshire / Humber area with a dense concentration of power plants and industrial emitters, offering potential to develop a cost effective CCS cluster.

To make the most of this potential and to support the work National Grid is already undertaking as part of its EEPF funded activities, the Government is exploring an option to support a FEED study (as part of the White Rose project) for a CO₂ pipeline with capacity in excess of that required for the Competition project alone. The pipeline, a 'Yorkshire / Humber CCS Trunkline', has the potential to support a number of CO₂ emitters through the provision of transportation facilities and access to CO₂ storage."

7 National Grid's Involvement with Specific Schemes for Carbon Capture in Yorkshire and Humber

7.1 WHITE ROSE

- 7.1.1 The White Rose CCS Project has commenced FEED work following confirmation by DECC that it had selected the White Rose CCS Project for funding under the Programme. National Grid is a member of the White Rose CCS Project with specific responsibility for developing carbon dioxide transportation and storage. Through the Onshore Scheme, National Grid will develop the onshore transportation infrastructure necessary for the operation of the White Rose CCS Power Station and for other future emitters to connect to overtime.
- 7.1.2 The Onshore Scheme is an NSIP and a consent application will be made to PINS during 2014. In advance of this application being submitted;
- A Scoping Report was published in December 2012 (Document 6.4.2);
 - The SoS responded with a Scoping Opinion in January 2013 (Document 6.4.3);
 - Consultation and publicity in accordance with Sections 42, 46, 47 and 48 of the Act were completed in summer, autumn and winter 2013/14 (Document 5.1).
- 7.1.3 This latest stage in the Programme comes after a period of detailed commercial discussions with the Government following the shortlisting of four projects from an initial list of eight. The White Rose CCS Project was scrutinised against criteria including project deliverability, value for money and the UK Government's own timetable to deliver a cost-competitive CCS industry in the 2020s. Capture Power will now continue to work with DECC with a view to concluding a Project Contract for the construction and operation of the full chain CCS project within the next 18 months.
- 7.1.4 Located on land adjacent to the existing Drax Power Station, near Selby in North Yorkshire, the proposed 426MW (gross) power plant will burn coal with the added ability to co-fire sustainable biomass and meet the equivalent power needs of over 630,000 homes. Fully equipped with CCS technology from the outset, 90% of all the Carbon Dioxide produced by the

plant will be captured and transported by cross country pipeline for permanent storage deep beneath the North Sea seabed.

- 7.1.5 The advanced nature of commercial development, consent application and engineering studies by Capture Power leads National Grid to conclude that the White Rose CCS Project will be the first CCS power station to connect to the proposed transportation and storage network.

7.2 DON VALLEY POWER PROJECT (DVPP)

- 7.2.1 The DVPP is anticipated to be a follow-on load to connect to the Cross Country Pipeline at the Multi-junction. The DVPP previously had been a strong candidate to be the first power station to connect to the Cross Country Pipeline. However, the project is currently being restructured as a consequence of failing to secure capital funding through the DECC CCS Commercialisation Programme competition. As a consequence of that restructuring DVPP issued its “EIA Scoping Report for the Variation of an Electricity Act Section 36” (REF) to DECC in November 2013 reflecting a reduced scale power station.
- 7.2.2 Funding from the European Commission’s European Energy Programme for Recovery (EPR) has been harnessed to substantively progress this application for the onshore scheme as the Cross Country Pipeline presents significant benefits to the DVPP. The interconnecting pipeline for the DVPP will be consented at a later stage when on-going restructuring activities have been completed.
- 7.2.3 The DVPP is anticipated to be a follow-on load to connect to the Cross - Country Pipeline at the Camblesforth Multi-junction installation. The DVPP previously had been a strong candidate to be the first power station to connect to the Cross -Country Pipeline. However, the timetable and other aspects of the DVPP project are being restructured as a consequence of failing to secure capital funding through the DECC Programme.
- 7.2.4 In 2009, the European Commission (EC) launched the EPR economic stimulus package designed to increase spending in energy infrastructure, offshore wind and CCS. In addition to stimulating the economy and safeguarding jobs, investment in these strategic sectors was designed to contribute significantly toward Europe meeting agreed energy and climate change targets. Almost €4bn was set aside for this programme, of which €1bn was awarded to six CCS projects.
- 7.2.5 2Co Energy Ltd, 2Co Power (Yorkshire) Limited (the owners of DVPP) and National Grid are ‘Co-beneficiaries’ of a €180m EPR grant in relation to the DVPP, facilitating the delivery of work with a total value of €245m. The

EEPR grant provides part-funding toward a specified programme of development work in relation to the end-to-end CCS chain, including:

1. Development of up to 980MW (gross) of power generation, led by 2Co Energy Ltd and 2Co Power (Yorkshire) Limited, with the potential to use a combination of coal and natural gas, and with full carbon capture. The precise technology to be utilised is currently under review as part of the on-going DVPP restructuring exercise;
2. The development of a shared, multi-user regional Carbon Dioxide transportation system, led by National Grid, for the Yorkshire and Humber region and to include delivery of all necessary studies, reports and analysis to support the anticipated approval pursuant to the Planning Act 2008 (Ref 5); and
3. Identification and characterisation by National Grid of suitable offshore storage site(s). The 5/42 saline formation about 90 kilometre off the East Yorkshire coast has been selected as the preferred storage site. DECC has awarded the first ever Carbon Dioxide appraisal and storage licence in respect of this site and intrusive appraisal drilling took place during summer 2013. Studies and analysis of the core material, water samples and drilling data are on-going.

7.2.6 EEPR has been fundamental in enabling progress of the DVPP and in particular it has underpinned National Grid's commitment to progress the consenting activities associated with the Cross Country Pipeline for the Onshore Scheme as the development of this 'shared' infrastructure will significantly benefit DVPP. It should be noted that whilst the consenting activities associated with the Cross Country Pipeline from the Camblesforth Multi-junction to the coast have been supported with EEPR funding as it forms part of the 'shared' infrastructure, the interconnecting link pipeline for the White Rose CCS Project from Drax to the Multi-junction has been funded from other sources, as per the requirements of the EEPR grant.

7.2.7 Discussions have been on-going between DVPP and DECC in relation to accessing a premium electricity price through the prospective Electricity Market Reform's 'enabling' Contract for Difference ("CfD"). The CfD application process runs throughout the first-half of 2014 with a decision anticipated later in the year. This process, alongside other restructuring activities, should enable DVPP to make a final investment decision in late 2015, potentially supported through 'enabling' CfD arrangements with DECC (as outlined above).

7.2.8 The direct impact of the DVPP's on-going restructuring exercise on the consenting strategy has been the adoption of a two-phased approach:

- Phase 1 – Secure consent for the Cross Country Pipeline through a DCO using White Rose as the ‘anchor load’ and recover any costs associated with the ‘shared’ infrastructure through EEPR; and
- Phase 2 – Seek consent for the interconnecting pipeline from Don Valley to the Camblesforth Multi-junction, with the likely route being the Town and Country Planning Act 1990 (Ref 20). The later commencement of this phase allows DVPP more time to develop the design, business case and funding strategy.

7.2.9 The above sequencing of the planning consent applications reduces the risk at each phase by ensuring that all relevant, appropriate information is available in full and in a timely fashion for each application. On the basis that the restructuring of the DVPP is completed as planned, and that there are no unforeseen issues with securing the proposed consents, then the timing of each phase will be scheduled to align the delivery of the decision dates from the appropriate consenting authority around Q2 2015.

7.3 C.GEN – NORTH KILLINGHOLME

7.3.1 C.GEN is seeking consent to build a 470MW power station on the south bank of the Humber Estuary, near North Killingholme, North Lincolnshire. The power station will provide enough electricity to power one million homes (PINS Ref: EN010038).

7.3.2 This NSIP will be carbon capture ready. National Grid and C.GEN have held exploratory discussions about how to transport and store the resulting Carbon Dioxide. If connected, a new pipeline would be built from the proposed power plant to the Camblesforth Multi-junction. This transportation solution is available to CGEN only if the Yorkshire and Humber CCS Cross country Pipeline is constructed and cannot commence before the proposed pipeline becomes operational.

7.3.3 With respect to consenting for North Killingholme, C.GEN has;

- Submitted DCO Application to PINS – March 2013.
- DCO Application accepted for examination – April 2013.
- Examination of C.GEN's DCO Application. – September 2013 to March 2014.

7.3.4 At this stage National Grid does not have a formal commitment to develop transportation or storage solutions for C.GEN.

7.4 STORAGE LICENCE

7.4.1 National Grid has identified a location for the storage site that it wishes to develop. The relevance to this application is that it provides a place to

securely store the Carbon Dioxide and hence completes the CCS chain. The location of the store also underpins the route that the Cross Country Pipeline must take to complete the connection between power stations and the store.

- 7.4.2 The Crown Estate is the owner of the Carbon Dioxide storage rights on the UK continental shelf and Agreements for Lease provide exclusive time limited options that enable developers to enter into competitions for Government funding assistance and to progress their CCS projects through to FID. On 14th February 2012, National Grid signed an Agreement for Lease with The Crown Estate. This agreement is for the selected offshore saline aquifer which predominantly underlays in petroleum license blocks 42/25 and 43/21 approximately 90 kilometres from the East Yorkshire coast. The wider Agreement for Lease area overlaps parts of petroleum license blocks 42/19, 42/20, 42/24, 42/25, 42/29, 42/30, 43/16, 43/21, 43/22, 43/26 and 43/27.
- 7.4.3 Section 17 of the Energy Act 2008 requires that in order to undertake activities within the area of a Crown Lease, an Operator is also required to obtain a Storage Licence from DECC who regulate appraisal and development activities for Carbon Dioxide exploration, appraisal and storage as they do for Oil and Gas activities. Carbon Dioxide Appraisal and Storage Licence was obtained from DECC on 6th November 2012.
- 7.4.4 Having obtained these consents National Grid drilled a well to appraise the selected storage site and prove its viability for long term Carbon Dioxide storage in the summer of 2013. The drilling operation was successful and results obtained to date confirm the viability of the storage site.

8 Transportation and storage design

8.1 TRANSPORTATION CAPACITY

- 8.1.1 The transportation system, will have a capacity of 17 Mt/y. The first load from the White Rose CCS Project will be approximately 2 Mt/y. National Grid anticipates that the unused capacity will progressively be taken up by follow on loads as other carbon capture plants are developed across the Yorkshire and Humber region.
- 8.1.2 The quantities of Carbon Dioxide supplied by each follow on load and their locations cannot be known with certainty at this stage. National Grid believes that there exists a reasonable potential to fill the proposed Cross Country Pipeline. The rationale for that view and how it is factored into the proposed design is described below.

8.2 EARLY PHASE CANDIDATES FOR CONNECTION

- 8.2.1 The White Rose CCS Power Station is expected to be the first connectee to the Cross Country Pipeline. The two prime candidates for connection as follow on loads, based on the development activity to date are DVPP and C.GEN. They would provide up to 5 Mt/y and 2.6 Mt/y respectively. Pipelines from both of these loads would connect into the Cross Country Pipeline at Camblesforth.
- 8.2.2 The Operator of Drax power station has made it clear that they would like to have an option to expand the use of carbon capture technology at the Drax power station. This would most likely involve fitting the technology onto some or all of the existing electricity generating units at the site. Based on discussions with the operator of Drax it is believed that an initial development of carbon capture for the existing generating units might seek to capture up to 5 Mt/y. Reported emissions for the whole site in 2009 are 19.9 Mt/y. The connecting Pipeline between Drax and the Camblesforth Multi-junction installation may be able to take some or all of the additional Carbon Dioxide depending on what is finally planned. The uncertainty about this is based on limited knowledge of the location of any new carbon capture facilities and the degree of difficulty involved in making the connection.

- 8.2.3 If a CCS development goes ahead in North Lincolnshire then it is anticipated that, if National Grid constructs that new pipeline, the pipeline route would probably take into account the potential for connecting industrial emitters of Carbon Dioxide along the Humber Estuary and near Scunthorpe. The most notable candidate in the Scunthorpe area is the Tata Steel Works with reported emissions of 5.1 Mt/y. The proportion of Carbon Dioxide that could be captured is unclear at this stage.
- 8.2.4 Other new power stations or retro-fitting of carbon capture technology onto existing power stations or industrial applications may change the sequence of follow on connections. To a large degree this will be determined by the evolving economics of CCS. The White Rose CCS Project is partly sponsored by the Government to help develop understanding of those costs and to enable efficiencies to be identified for follow on developments.
- 8.2.5 Whilst the exact size and location of future loads is uncertain National Grid is of the opinion that there is sufficient potential in the area to justify constructing a pipeline of 17mt/y. A smaller capacity pipeline could necessitate the construction of duplicate onshore and offshore pipelines in the future if sufficient demand materialises creating additional local disruption. Construction of a larger capacity pipeline has been rejected on the basis of the larger uncertainties that are associated with expectations that ever larger demands will materialise and a significant uncertainty about development of a matching storage capacity.

8.3 MULTI-JUNCTION

- 8.3.1 The Camblesforth Multi-junction has been designed to readily enable the connection of additional pipelines. The Multi-junction will enable up to five pipelines to be connected. Initially two connections will be made, to the connecting pipeline from White Rose and to the Cross Country Pipeline itself. Basic facilities will be installed to enable three further pipeline connections in the future. The additional pipelines would be anticipated to come from the more industrialised regions of North Lincolnshire, South and West Yorkshire.
- 8.3.2 The first two pipelines and the Multi-junction itself are the subject of this application. In this section we have identified the follow on loads that we consider to be most likely but the exact sources, routes and loads remain speculative at this time.

8.4 STORAGE CAPABILITY

- 8.4.1 The storage site that National Grid has identified for development has a nominal capacity of 200 million tonnes. The anticipated contractual term of

the White Rose CCS Project is either 10 or 20 years (to be agreed with DECC) and it is clear that an injection rate of 2.65 Mt/y for either 10 or 20 years will not come close to using up the available space in the store. The remaining space can be used to store Carbon Dioxide from other power stations or industrial emitters.

- 8.4.2 The offshore platform located above the proposed store will have an expansion capability that will be similar in concept to the proposed Barmston Pumping Station. The equipment installed initially, including injection wells for transferring Carbon Dioxide from the Pipeline to the store, will be sufficient to service the White Rose CCS Project only. However, deck space, load bearing capability and expansion capabilities will be in place so that more injection wells can be installed as required. Each new injection well will increase the rate at which the store can be filled with Carbon Dioxide up to a maximum of 10 Mt/y. Deck space will be provided on the platform to install pumping capacity and connect new sub-sea pipelines that can supply other storage sites and potential Enhanced Oil Recovery (EOR) operations in the North Sea. The Pipeline, would be designed to be capable of sending Carbon Dioxide onwards, through new pipelines, to other destinations whilst a maximum of 10 Mt/y is injected into the store. This 'hub' concept is an offshore equivalent to National Grid's aspirations for the Camblesforth Multi-junction which would act at a 'hub' for future onshore connections.

8.5 FUTURE STORAGE SITES

- 8.5.1 National Grid has conducted a regional assessment of potential Carbon Dioxide storage sites across a large part of the central and southern North Sea. The assessment ranked potential storage sites so that the best candidates would offer a combination of lowest risk and the best value for money. The storage site under development was ranked first in that assessment. A number of other candidate sites, ranked second and third were identified that are in close geographic proximity to the first proposed storage site. This will enable a pipeline connection to be built between the proposed offshore platform and a new storage site when demand increases to the point that the first site either has insufficient capacity day by day to store the Carbon Dioxide or the site is simply expected to become full. Once the storage site is full, the wells will be sealed and the store will be periodically monitored to ensure that the Carbon Dioxide is not leaking from the store. 40 years after sealing the wells ownership of the store will be handed back to the UK Government. Prior to that, liabilities for ensuring that the Carbon Dioxide remains contained within the store will remain with National Grid.

8.6 ASSET LIFE

8.6.1 The asset life of the Pipeline and Offshore facilities will be 40 years wherever practicable. Shorter asset lives may be required for certain equipment where wear and tear or obsolescence is a particular difficulty. In these instances an asset management plan will ensure monitoring and timely replacement of equipment as it nears the end of its useful life. The difference between the commercial life (10 or 20 years) of the White Rose CCS Power Station and the transport and storage infrastructure asset life (40 years) is made necessary by National Grid's objective of creating a multi-user network. Other customers can make use of the infrastructure alongside and after the White Rose CCS Project's requirements for transport and storage. Once Carbon Dioxide has been injected into the store it will remain there in perpetuity, regardless of whether the transport infrastructure or the platform are still operational.

8.7 CARBON DIOXIDE SPECIFICATION

8.7.1 A key component of providing a multi-user transport and storage network is to ensure that Carbon Dioxide supplied from various CCS facilities is compatible with the design of the transportation and storage infrastructure. National Grid has conducted extensive research alongside a programme of tests to ensure the compatibility of anthropogenic Carbon Dioxide with the pipeline and transportation system design. The key question here is what quantities of impurities in the Carbon Dioxide stream are conducive to safe and reliable operation of the various transport and storage facilities. In conducting this research National Grid has also been keen to facilitate as wide a specification as possible so that it in turn enables as wide a variety of Carbon Dioxide capture technologies as possible to be applied by the power station designers. The specification that National Grid has developed was originally developed and originally agreed with 2CO Power (Yorkshire) Limited. It has subsequently been discussed and agreed with Capture Power. It has been shared with C.GEN and it is understood they have no objection. National Grid has completed an extensive programme of testing to prove that the specification is compatible with safe operation of the Pipeline and Store. It is compatible with connecting a wide range of Carbon Dioxide capture technologies to the proposed Cross Country Pipeline.

9 Conclusion

- 9.1 There is clear national planning policy support for the development and use of carbon capture and storage technology. The Overarching National Policy Statement (EN-1) recognises the contribution CCS can make to meeting emissions targets, as well as to enable the UK to continue to use fossil fuels as part of its generating capacity.
- 9.2 NPS EN-1 recognises the need to develop a CCS pipeline as a demonstration project, and that this may be designed to form part of a wider pipeline network with future emitters in mind.
- 9.3 NPS EN-1 therefore supports the need for the Onshore Scheme in explicit terms because *“there is a need for CCS fossil fuel generating stations and the need for the CCS demonstration projects is urgent”* and *“the demonstration programme will also require the construction of the essential infrastructure (such as pipelines and storage sites) that are sized and located both for the purpose of the demonstration programme and to take account of future demands beyond the demonstration phase”*.
- 9.4 The Yorkshire and Humber region provides an excellent opportunity for a demonstration project to form the basis for a regional network, capturing large volumes of carbon from a cluster of substantial emitters. There is a tradition of heavy industry in the area, which has led to the location of clusters of carbon dioxide emitters in the region.
- 9.5 The White Rose CCS Project has been identified as the initial emitter for the purposes of the demonstration project. The White Rose CCS Project (and together with it the Onshore Scheme) is a potential beneficiary of funding from DECC through its commercialisation competition.
- 9.6 There are good prospects of other emitters connecting in due course. This is both because, in general terms, the Onshore Scheme is located in the Yorkshire and Humber near to clusters of emitters; and specifically there are projects such as DVPP and C.GEN (North Killingholme) that are at various stages of project development.
- 9.7 The Onshore Scheme is sized to enable future connections, and incorporates a multi-junction that is designed to accommodate up to three additional emitters. The capacity of the pipeline is greater than the volume flows of carbon dioxide expected from the White Rose CCS Project alone.

The multi-junction is sited so that it may become a “hub” for future connections.

- 9.8 There is therefore a very clear need for the Onshore Scheme to be granted development consent, and then to be implemented as soon as possible.

10 References

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Ref 3 HMSO (1998); 'Petroleum Act 1998'. The Stationery Office, <http://www.legislation.gov.uk/ukpga/1998/17/contents>

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Ref 5 HMSO (2008) 'Planning Act 2008'. The Stationery Office <http://www.legislation.gov.uk/ukpga/2008/29/contents>

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Ref 7 International Energy Agency Technology Road Map: Carbon Capture and Storage 2013
<http://www.iea.org/publications/freepublications/publication/name,39359,en.html>

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Ref 9 http://ec.europa.eu/clima/publications/docs/factsheet_ccs_en.pdf

Ref 10 <https://www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies/supporting-pages/carbon-capture-and-storage-ccs>

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Ref 15 <https://www.gov.uk/government/publications/ccs-in-the-uk-government-response-to-the-ccs-cost-reduction-task-force--3>

Ref 16 Holloway et al (2006) “Industrial Carbon Dioxide Emissions and Carbon Dioxide Storage Potential in the UK”, Report No. Coal R308 DTI/Pub URN 06/2027 2006 pp. 2-4.

Ref 17 [www.yorkshire-forward.com/sites/default/files/documents/Yorkshire Humber Carbon Capture Storage Network.pdf](http://www.yorkshire-forward.com/sites/default/files/documents/Yorkshire%20Humber%20Carbon%20Capture%20Storage%20Network.pdf), A Carbon Capture and Storage Network for Yorkshire and Humber (Yorkshire Forward Regional Development Agency, 2008).

Ref 18 Wikipedia.org / Yorkshire and the Humber.

Ref 19 <http://www.yorkshire-forward.com/> Yorkshire Forward’s Chief Executive Tom Riordan, in response to the government’s designation of Yorkshire and Humber as a Low Carbon Economic Area, 17th March 2010.

Ref 20 HMSO (2012 as amended) Town and Country Planning Act

Appendix 1 - A timeline of UK climate-change policies

Below is a list of policies issued in the UK relating to climate change in chronological order.

- **1989: The Non Fossil Fuel Obligation (NFFO)** and the Scottish Renewables Obligation (SRO) were established under the Electricity Act 1989. Originally intended to support nuclear electricity generation, the NFFO and SRO were expanded in 1990 to include renewables. The NFFO and SRO were funded by a **Fossil Fuel Levy** paid by suppliers of electricity from fossil fuels.
- **2000: Climate Change Programme.** This report sets out policies and priorities for action both in the United Kingdom and internationally. Updated in 2006, the policies are supposed to reduce Carbon Dioxide emissions by 15-18% below 1990 levels by 2010 and overall GHG emissions by 23-25%.
- **2001: The Climate Change Levy (CCL)** was introduced on 1 April 2001, effectively replacing the Fossil Fuel Levy. It is a downstream tax on non-domestic energy use by industry and the public sector, designed to incentivise energy efficiency and emission reductions, with part of the revenue being used to reduce National Insurance contributions. Energy-intensive firms can receive up to an 80% discount if they join a **Climate Change Agreement (CCA)**, which requires meeting energy efficiency or carbon-saving targets. Renewable electricity suppliers are exempt from the CCL. Receipts from the CCL amounted to £0.7 billion in 2009.
- **2002: The Renewables Obligation (RO)** replaced the NFFO and SRO as the primary renewable energy policy instrument. The RO requires electricity end-suppliers to purchase a certain fraction of their annual electricity supply from producers using specific renewable technologies, and they receive tradable Renewables Obligation Certificates (ROCs) for doing so. The supplier can also 'buy out' the obligation by paying a set price per MWh. The buy-out revenue is recycled to participating suppliers in proportion to their ROCs.
- **2002: The Energy Efficiency Commitment (EEC)** was introduced, requiring energy suppliers to achieve 62TWh of savings over the period to 2005 through assisting the implementation of home energy efficiency improvements, equivalent to a reduction in domestic emissions of approximately 1%. The second phase of EEC (2005-2008) raised the total savings required to 130TWh.

- **2005: European Union Emissions Trading System (EU ETS).** The UK Emissions Trading Scheme closed in 2006 and was replaced by the EU's that aims at ensuring compliance with the Kyoto obligations. Under the EU system, member states proposed National Allocation Plans (NAPs) to the European Commission, allocating a set proportion of a country's total 2008-2012 emission budget to sectors covered by the scheme; tradable quotas were then divided among firms (see also: www.eea.europa.eu/pressroom/newsreleases/questions-and-answers-on-key).
- **2008: Climate Change Act.** This Act set a legally binding target of 80% reductions in emissions from 1990 to 2050. A medium-term target of a 34% reduction by 2020 was also adopted, with the promise of a further tightening in the event of a global deal on climate change. To achieve these targets, the Act established the principle of five-year carbon budgets. The first three budgets were set in 2009 and cover 2008-12, 2013-17 and 2018-22. The fourth budget, 2023-2027, was accepted by the Government in June 2011. Contributions from the use of carbon trading and offsets will be allowed. There will be a review in 2014 to ensure that the UK efforts are not disproportionate relative to those of other EU members). The Government must submit its policies to meet these budgets to Parliament, as it did in the **Low-Carbon Transition Plan** of July 2009, which set out policies to cut emissions across the power and heavy industry sector; the transport sector; in homes and communities, workplaces and jobs; in agriculture; and in land use and waste management. The Act also required the government to include aviation and shipping emissions, or provide an explanation why not, by the end of 2012.
- **2008: Carbon Emission Reduction Target (CERT).** This scheme replaced the Energy Efficiency Commitment, with a greater focus on more substantial and robust household energy saving measures such as insulation, and a component targeted at those most vulnerable to fuel poverty. The total lifetime savings required from energy suppliers over the duration of the scheme until 2012 is 293million tonnes Carbon Dioxide.
- **2008: Renewable Transport Fuel Obligation (RTFO).** This is administered by the Renewable Fuels Agency and requires suppliers of fossil fuels to ensure that a specified percentage of UK road fuel supply is from renewable fuels (biofuels). The target for 2009-2010 is 3.25% of fuels by volume. Suppliers may buy out their obligation for 30 pence/litre. The amount of biofuel that must be supplied increased annually until April 2013 when it reached 4.75% of total road transport fuel supplied by volume. There are currently no plans to increase this trajectory.