

Establishing a Carbon Capture and Storage Cluster in Yorkshire and Humber

Stephen Brown
Director

APGTF, London
14th March 2012

CO2Sense...

- Who we are : Not for profit, low carbon specialist, Community Interest Company
- What we do : We make things happen: support, advice, and investment:
 - More efficient resource use (energy, materials, waste)
 - Renewable energy feasibility & procurement
 - Cutting costs with green products and better design
 - Investment modelling: costs, revenues and returns
 - Strategic low carbon initiatives e.g. CCS, electric vehicles
- Our clients include : United Nations, Asda, Northern Foods, Molson Coors
- We have delivered : Worked with 1,600 companies
 - : Invested over £12m in energy and waste projects
 - : Saved 1.2 million tonnes of CO₂

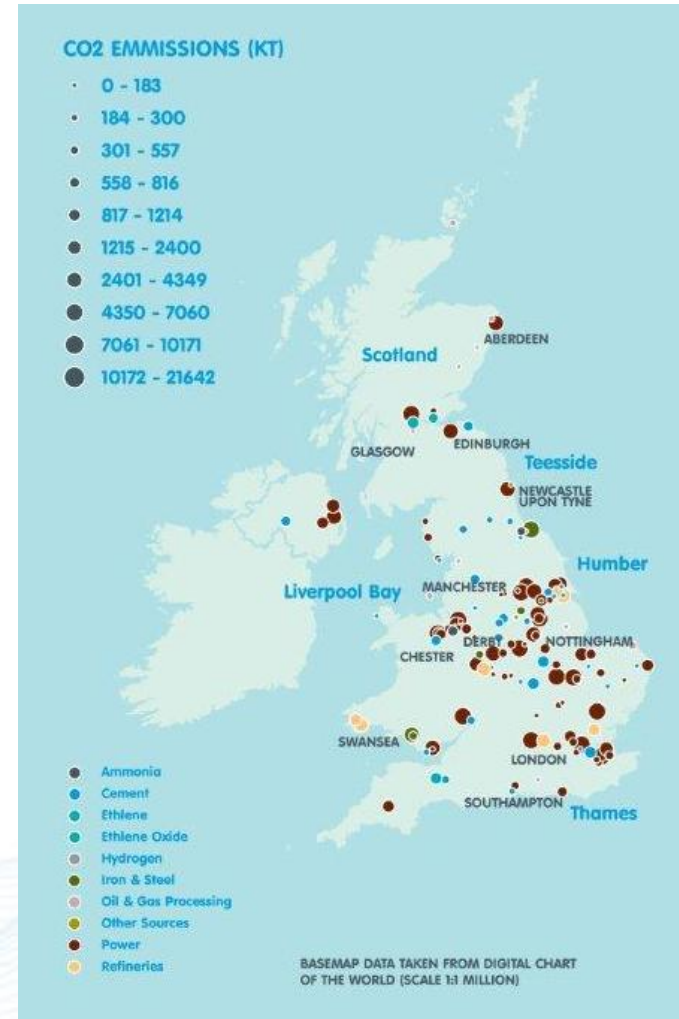
Why CCS in Yorkshire and Humber?

- 60Mt of CO₂ emissions from single point sources
- Range of sectors – not just coal-fired power generation
- Located in a relatively small geographic area
- Adjacent coastline to southern North Sea gas fields
- Considerable industry interest
- Opportunity to gain a world lead for the

region

co₂sense[™]

carbon sense 2 commercial sense



Why Clusters ?

- Exploit existing industrial infrastructure
 - Fuel/material supply
 - Grid connection
 - Pipeline wayleaves
 - Offshore oil and gas infrastructure
- Mitigate price/volume risk in CO₂ transport
- Cost effective and efficient
- But – requires oversizing of pipelines in early years

Cluster Opportunity

- Ferrybridge to Theddlethorpe picking up all large emitters
- CO₂ up to 125 bar but below critical temperature
- Tree structure more appropriate
- Phased development from 2011 to 2030
- Opportunity to reuse some existing gas infrastructure
- Could target two clusters of gas fields for storage
- CAPEX +£2bn; 55,000 construction jobs; £30bn GVA
- 8.6Gt CO₂ storage in gas fields and saline formations - beyond 2050
- Regional network more cost effective for each emitter than individual 'source to store' projects

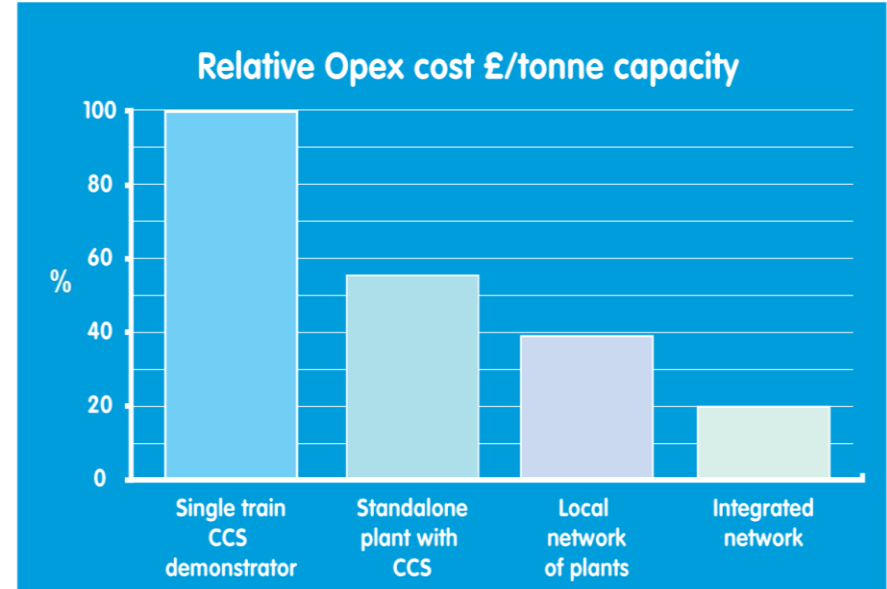
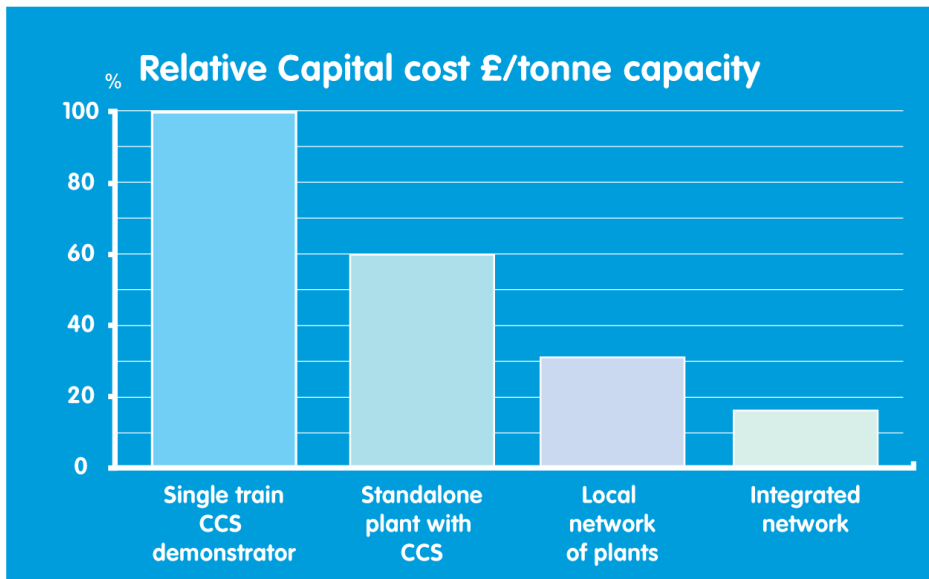


- POWER STATION
- INDUSTRIAL EMITTER
- ▲ EXISTING SHORE TERMINAL
- ➔ POTENTIAL HUMBER CROSSING
- ➔ NORTHERN ROUTE
- ➔ POTENTIAL SOUTHERN ROUTE



Pre- FEED Level Pipeline Costs

- 40mt capacity, up to 100km offshore



- Two separate phases, £896m
- Two integrated phases, £643m
- At least 10 years 'no regrets' of initial reserve capacity

Demonstration Projects

NER300 bids submitted from Yorkshire and Humber

- Don Valley Power (2Co Energy, Hatfield) 900MW IGCC
- Drax / Alstom 426MW oxy-fuel
- C.GEN (Killingholme) 570MW IGCC
 - National Grid Carbon supplying transport and/or storage options for all bids

EIB short listing 9th February, 2012

We can expect these and perhaps others to enter UK CCS competition in 2012

Yorkshire and Humber CCS Project

- Consultation Zone Boundary
- Preferred Pipeline Route Corridor
- Extended Pipeline Route Corridor Section
- Preferred Area Of Interest For Block Valve Site
- Other Routes And Block Valve Search Areas Considered

Mapping Data

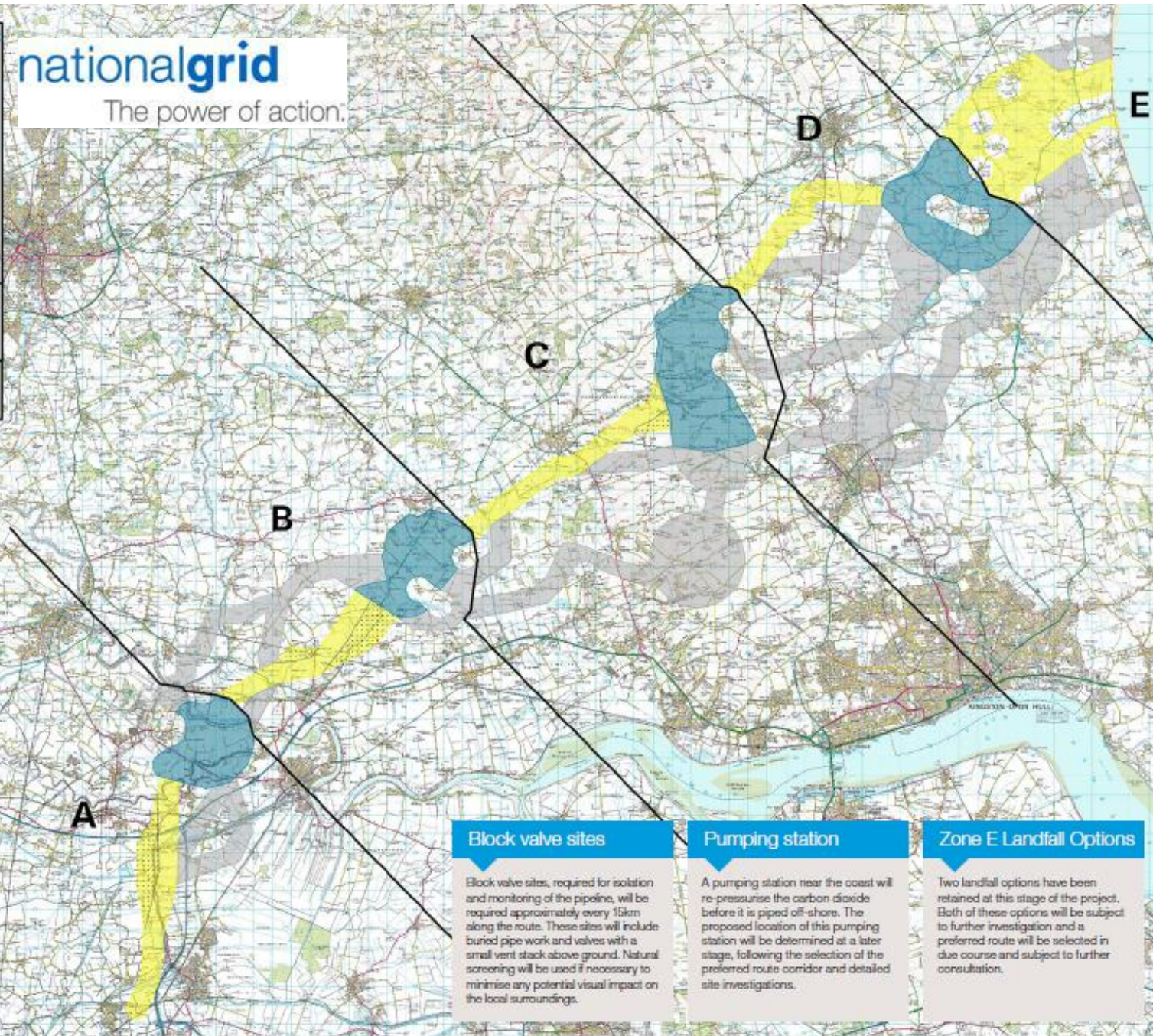
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Map Scale 1:190,000



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Block valve sites

Block valve sites, required for isolation and monitoring of the pipeline, will be required approximately every 15km along the route. These sites will include buried pipe work and valves with a small vent stack above ground. Natural screening will be used if necessary to minimise any potential visual impact on the local surroundings.

Pumping station

A pumping station near the coast will re-pressurise the carbon dioxide before it is piped off-shore. The proposed location of this pumping station will be determined at a later stage, following the selection of the preferred route corridor and detailed site investigations.

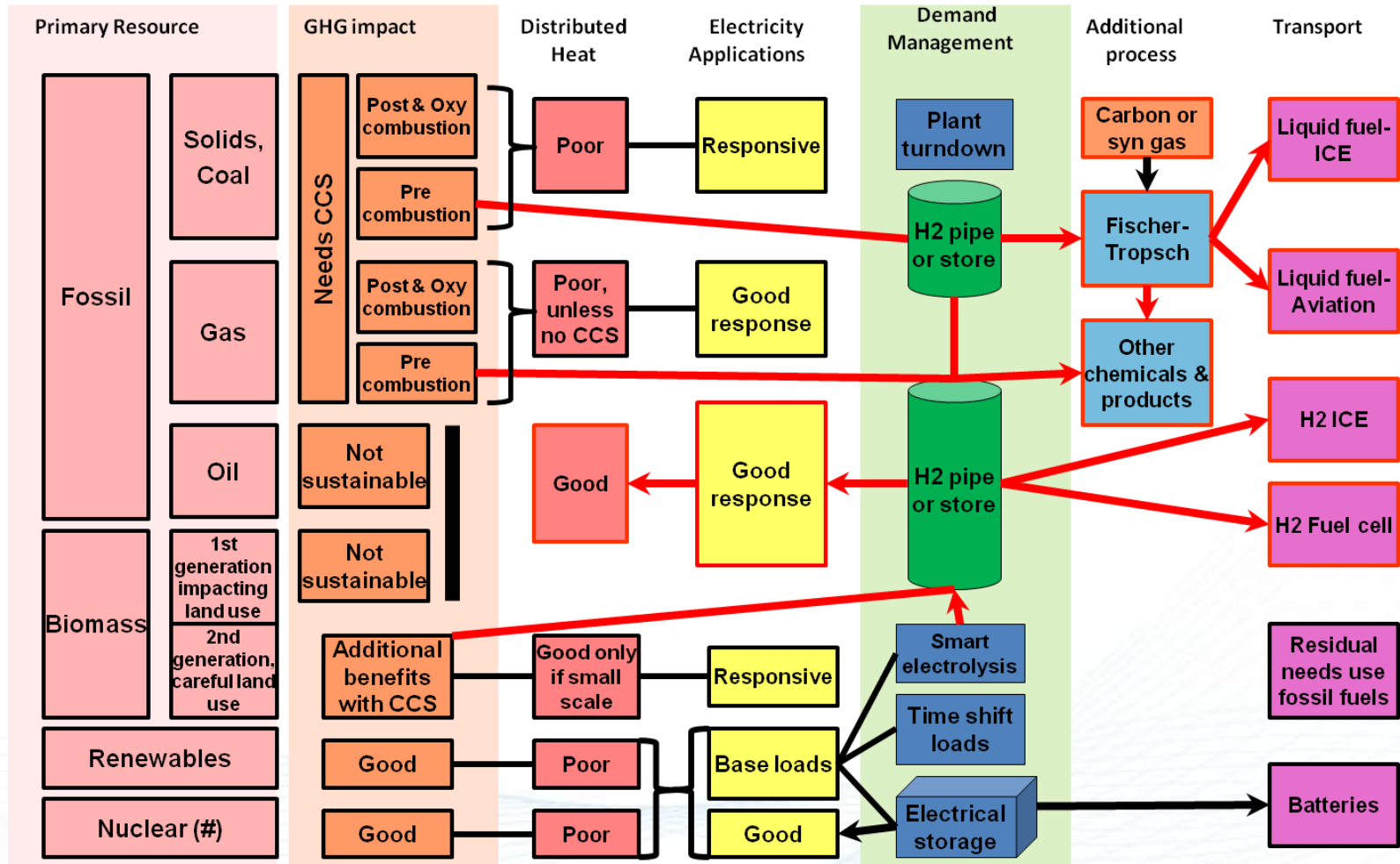
Zone E Landfall Options

Two landfall options have been retained at this stage of the project. Both of these options will be subject to further investigation and a preferred route will be selected in due course and subject to further consultation.

Storage of CO₂

- National Grid
 - Agreement for Lease of site 5/42 in Southern North Sea for CO₂ storage appraisal
- 2Co Energy
 - Evaluation of CO₂ storage and EOR options in the Central North Sea

Cross Industrial Benefits



(# Higher temperature reactors will be able to directly produce hydrogen – this benefit is not shown here)

AMEC October 2010

Technology Development Needs

Cost and Risk Reduction

Capture

- Chemical looping
- Poly-ionic liquids

Transport

- Compressor efficiency
- Dynamic multi user model

Storage

- Long term stability

CO2Sense CCS Network

Welcome to CO2Sense Yorkshire's Carbon Capture and Storage Supply Chain Network - Carbon Captur - Internet Explorer provided by

http://www.co2sense.org.uk/Networks/ccs/w/wiki/welcome-to-co2sense-yorkshire-s-carbon-capture-and-storage-supply-chain-network.aspx

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Carbon Capture & Storage Supply Chain

A private network for small and medium-sized enterprises in Yorkshire and Humber in the Carbon Capture & Storage supply chain. Click here to request membership.

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Welcome to CO2Sense Yorkshire's Carbon Capture and Storage Supply Chain Network

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Welcome to the Carbon Capture and Storage Supply Chain network.

As a new member you now have the opportunity to initiate or respond to discussions on Carbon Capture and Storage (CCS) technology, keep up to date with the progress of our programme through reading our blogs, and use our Resources to learn more about the technology and how this will be implemented in the region. You can view resources added by other members in the Documents section, or upload your own, you can also use the site to view a list of other members and get in touch with them directly.

Through becoming involved in the network and keeping up to date with the progress of CCS deployment in the region you could gain valuable information, and access to key sector contacts enabling your organisation to enter the supply chain taking advantage of the regional, national and world wide opportunities it brings.

For more information on how to use the Network and get the most out of the tools available to you, [visit the Welcome network](#).

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Positive Messages from DECC Industry Days

- Clustering
 - Viewed favourably
 - Enables industrial capture projects
 - Addresses risk reduction
 - Logical way to deliver the ‘Outcome’
- Bidders not restricted to single proposals or one consortium
 - A number of variants to support cluster establishment?

Next 12 months

- Enable bids into UK Competition
- Y&H project secures NER300 funds?
- Understand how to effectively use incentives and commercial funds
 - Other public funds e.g. RGF, GIB?
- Shape ideas on industrial capture project(s) to utilise R&D funds
- Progress on transport and storage consents
- Influencing
 - UK demonstration programme
 - EU SET Plan and structural funds post 2013



carbon capture
& storage

building
the pipeline
together





**“Let’s make Humberside lead
the world in Carbon Capture
and Storage”**

**David Cameron, PM
28 May 2010**

Thank You

stephen.brown@co2sense.co.uk

Tel: +44 113 237 8409

Mob: +44 7989 141195

www.CO2Sense.co.uk/networks