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Overview of the Teesside Collective Industrial CCS Project and respective insights on overall network issues

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UKCCSRC Workshop – Research Challenges in Industrial CCS
7th September 2015

Agenda

- Introduction
- Project Objectives and Overview
- Infrastructure Requirements
- ICCS Value Chain & Support Mechanism
- ICCS Business Case Output
- Next Steps for Teesside
- Key Insights for Industry and Research Challenges

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TVU Objectives

Tees Valley unlimited → TEESSIDE CO2LLECTIVE
A NEW INDUSTRIAL FUTURE FOR THE UK

Initiate 2014

- 4 companies from process industry
- Collaboration with DECC/BIS
- Experienced advisors
- Concept studies complete

Influence 2015+

- Targeted engagements in 2015 and beyond
- Re-branding
- Commercial mechanism
- Business case

Implement 2015+

- Developing *Next Steps* plan

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Teesside Overview

TEESSIDECO2LLECTIVE
A NEW INDUSTRIAL FUTURE FOR THE UK

5 major elements to capture, transportation & storage of 2.8 mTpa of CO2
1) Capture, 2) Gathering, 3) Boosting, 4) Offshore Transport, 5) Storage

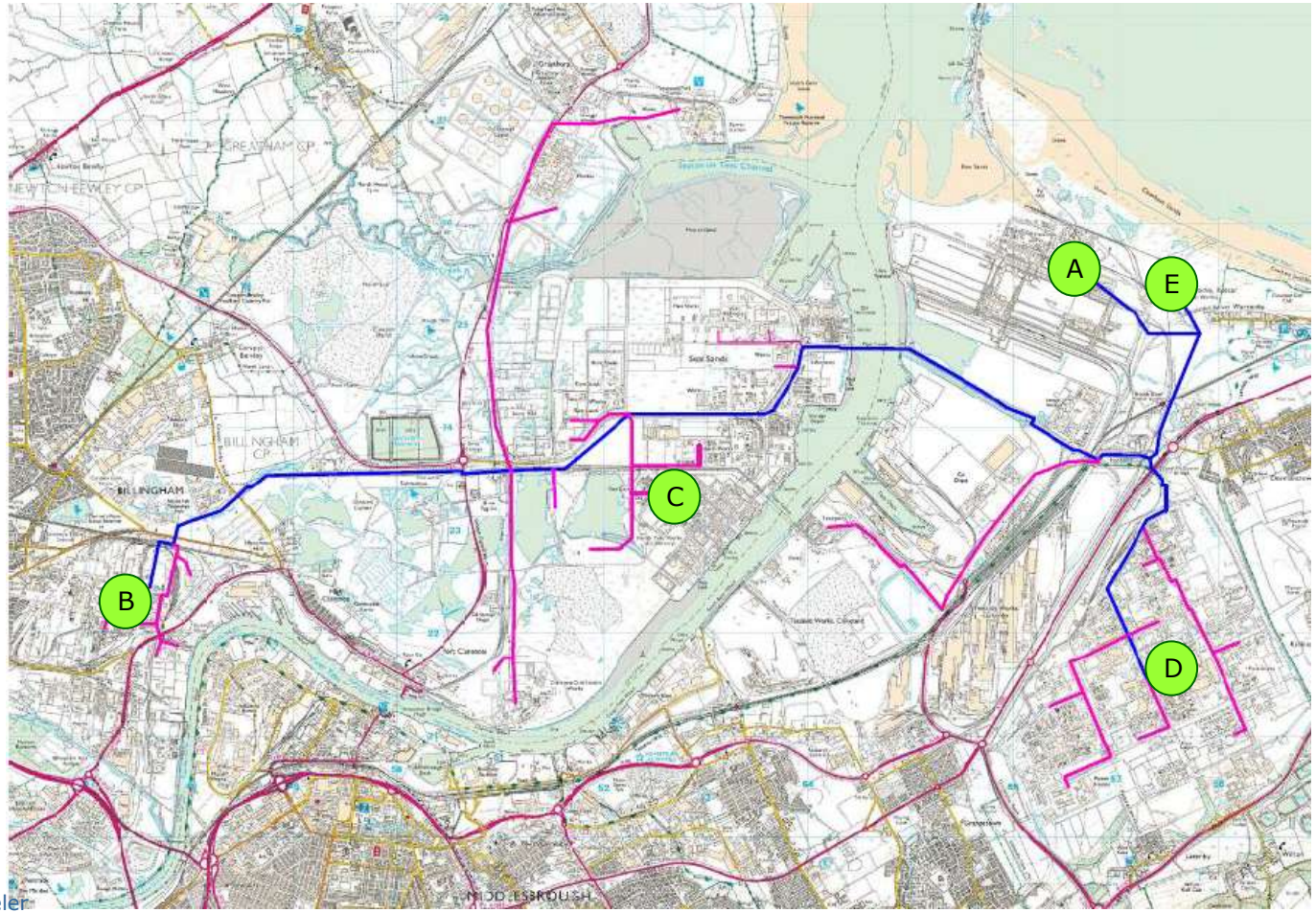

Image Source:
Amec Foster Wheeler

System Capacity

- 5 mTpa or
- 15 mTpa

Storage Solution

- Bunter 154km
- Captain 433km

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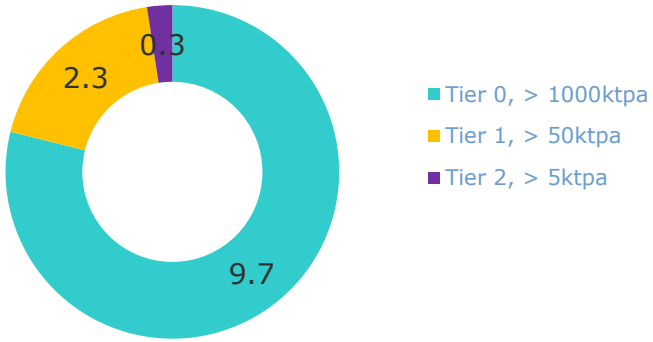
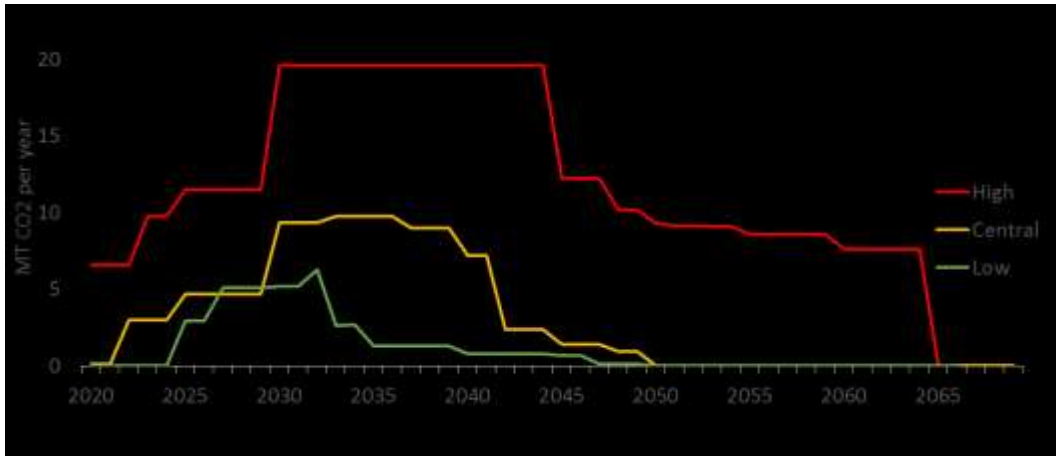
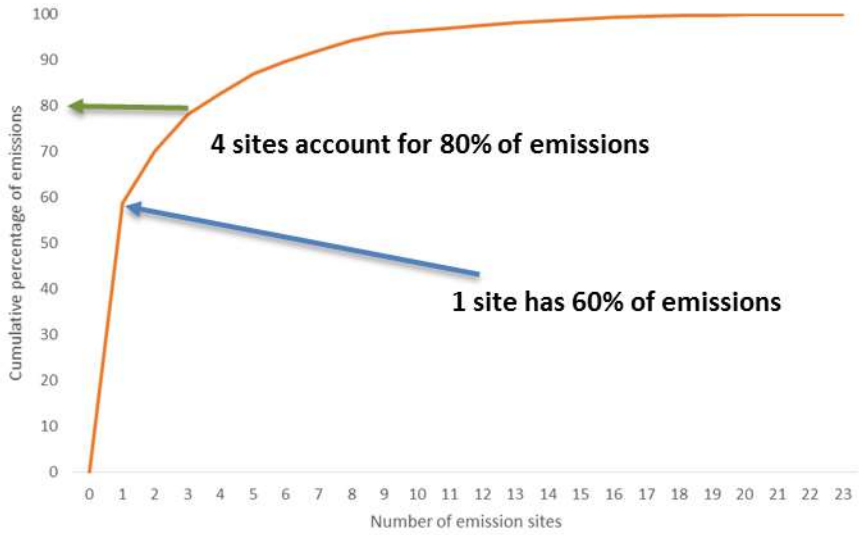
Estimating Infrastructure needs

12Mt CO2 currently emitted







- Multiple sources of CO2 supply
- CO2 volumes variable
- Longevity of the businesses
- Importance of timing of an acceptable ICCS investment mechanism

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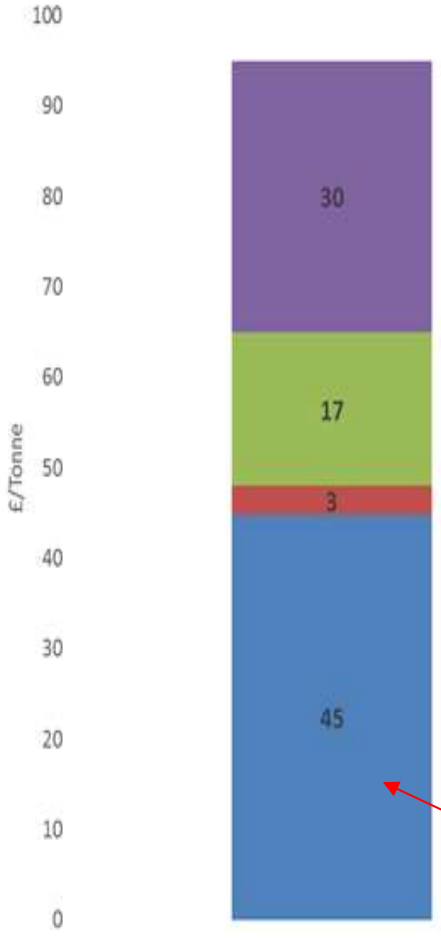
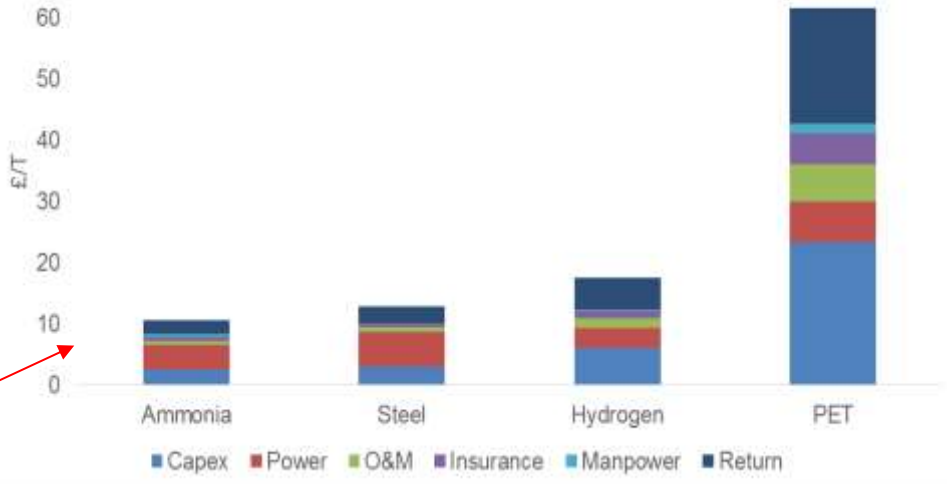
Business Case Output



Teesside ICCS is technically & economically viable:

- Scenario discounted capex cost ranges £0.8-£2.1bn
- Over 20 years the entire ICCS Chain for the Reference Scenario requires undiscounted financial support of £5.4bn (£1.5bn PV_7) equating to **£95/T** for 56.5mT CO_2 stored. (13% IRR. 7% Discount Rate)
- Capture 47%, Gathering 3%, Offshore 50%
- Trebling the infrastructure only requires an additional 8% of support (£104m)

	Financial Support (£/T over 20 years)	
Excluding Return	Undiscounted	PV7
Ammonia	25.5	8.4
Steel	30.5	10.1
Hydrogen	34.8	12.4
PET	116.7	42.8
Including Return	Undiscounted	PV7
Ammonia	37.4	10.5
Steel	45.3	12.7
Hydrogen	61.6	17.5
PET	214.9	61.6



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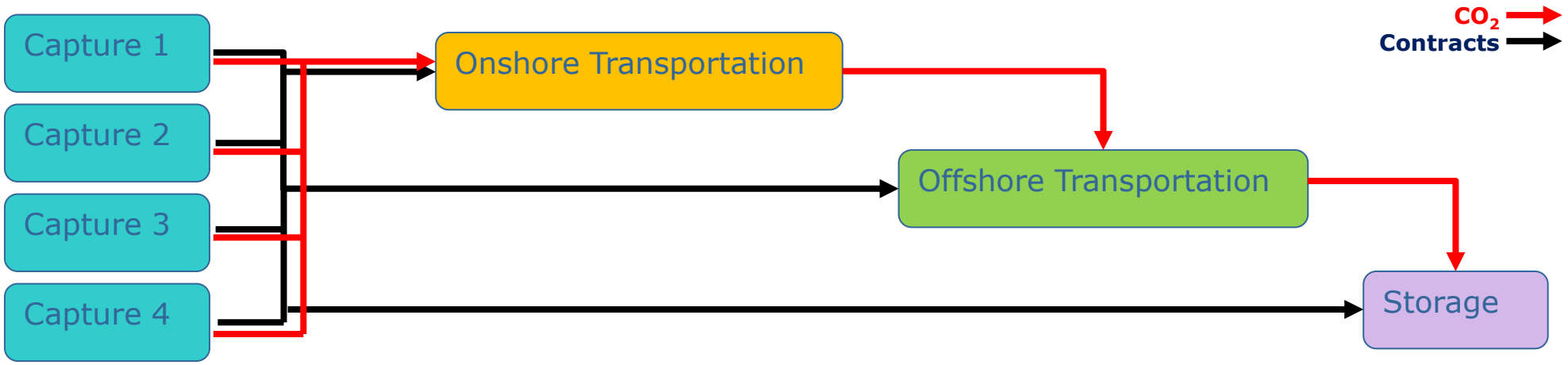
ICCS Value Chain – initial thoughts

- Disaggregated model
  - Each emission site will require a capture facility, which may be operated by the process company, or someone else
  - Onshore transportation of gases is commonplace & many interested players
  - Offshore transportation of gases is also commonplace but fewer players
  - Very few players in storage domain
  - Several variations all with multiple players, which adds commercial complexity



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Commercial Support Mechanism

Three options for a Funding Mechanism reviewed:

- a Storage Mechanism Payment
- a CO_2 CfD Emitter Mechanism
- a hybrid

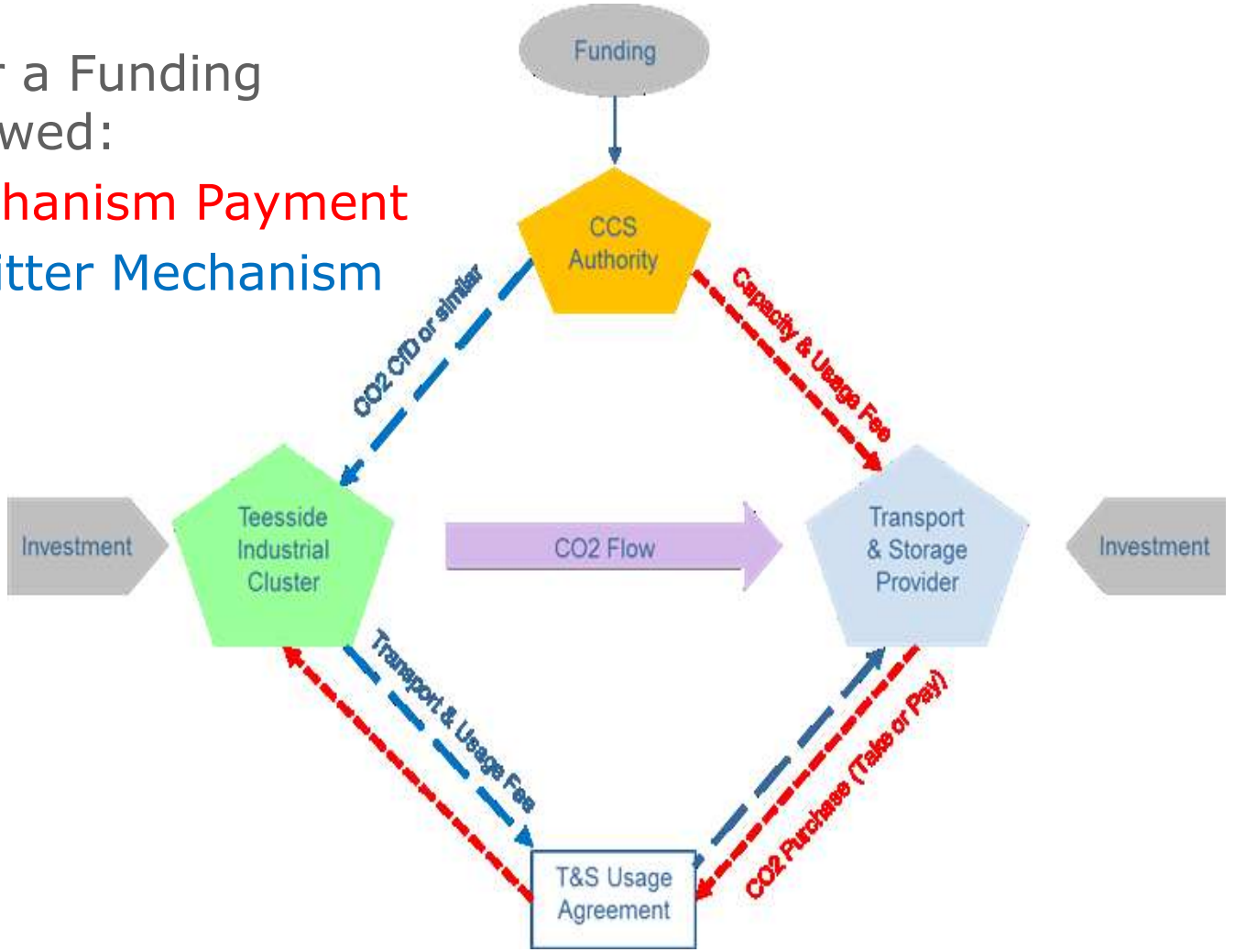

Image Source:
Societe Generale

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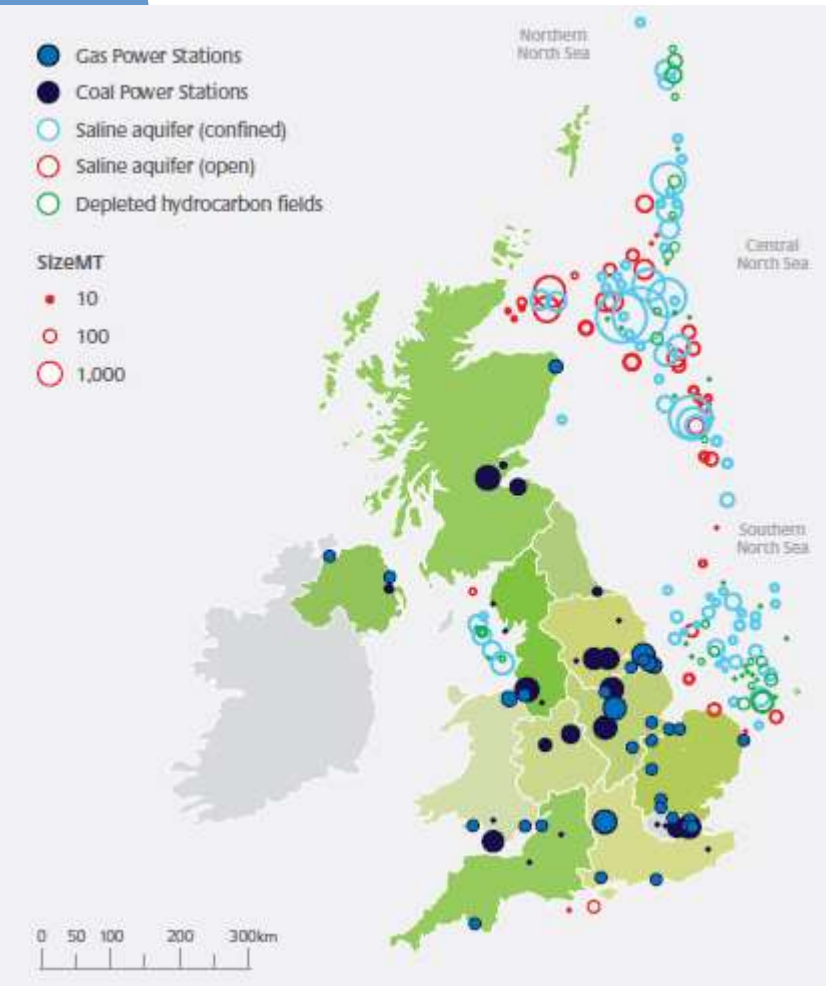
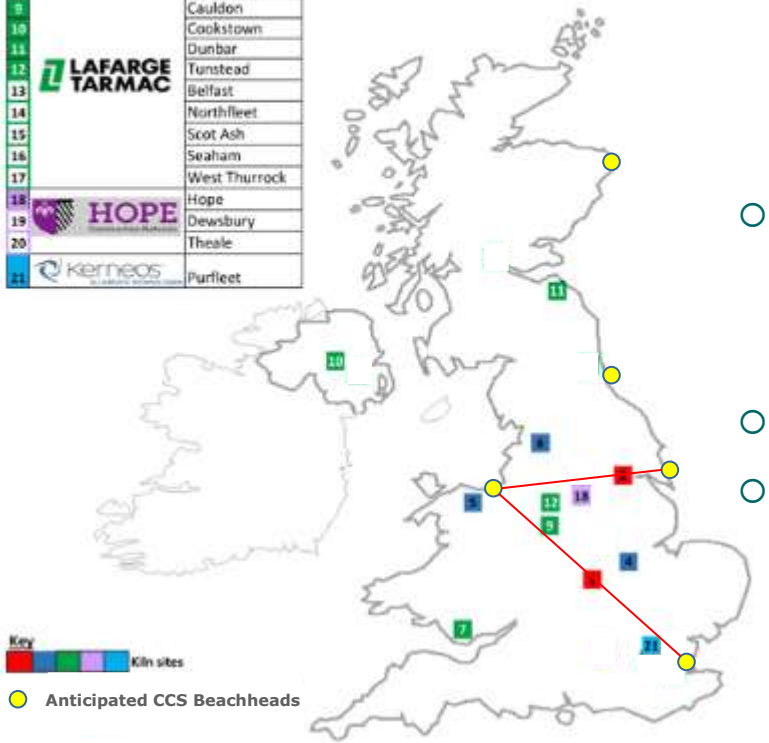
Cement Industry: CCS is core to Carbon Strategy



	Company	Site
1	cemex	Rugby
2		South ferriby
3		Tilbury
4	Hanson	Ketton
5		Padeswood
6		Ribblesdale
7	LAFARGE TARMAC	Aberthaw
8		Barnstone
9		Cauldon
10		Cookstown
11		Dunbar
12		Tunstead
13		Belfast
14		Northfleet
15		Scot Ash
16		Seaham
17		West Thurrock
18	HOPE	Hope
19		Dewsbury
20		Theale
21	kerneos	Purfleet



- CCS Progress
  - Capture via 2 options √
  - Oxyfuel at €50/T CO_2
  - Storage??
- Scale of Factory
  - 1-2 mT
  - 10 mT
- Regional Solutions
- CCS Cost in relation to Cement Cost

Image Source:
ETI and MPA

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Summary of Key Network Issues

- TC, structure and contracted partners worked very well
- Perceptions for Risk & Return (0 to 25+% range)
- Ownership
- Full Chain Costs: 50% Capture, 50% Transport & Storage
  - Lots done and known on capture. Cost reduction??
  - Transport & Storage??
    - Appraisals, Risk reduction, Cost reduction
- Commercially more complex versus a single full chain power station project
  - Multiple sources, vastly differing scales, cross-chain liabilities
  - Increased risk of commercial carbon leakage
  - Multiple players add complexity to risk allocation & financing
- Financial support needs are significant. Commercial mechanism attractive to global corporations
- Getting started

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Summary of Research Challenges

- Is a cement kiln operation viable on Teesside and if so at what capacity?
- Where else can collaboration across the high emitter sectors of Cement, Power, Refineries and Steel deliver gathering network solutions?
- Will consumer accept CCS? What is societal thinking about the risks and cost/value of carbon. How much will Governments & Public be prepared to pay for Low Carbon Solutions?
- What IRR will be acceptable for each element of the chain?
- What will make Transportation and Storage less risky?
- Can further significant cost reduction be achieved on Capture?
- Can further storage appraisal lead to major cost reduction?
- What funding mechanism will be politically acceptable?

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