



A NEW INDUSTRIAL FUTURE FOR THE UK

Developing an industrial CCS network in Teesside

Sarah Tennison

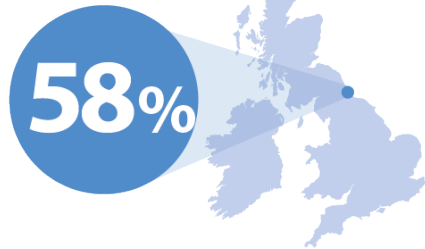
@Teescollective

www.teessidecollective.co.uk



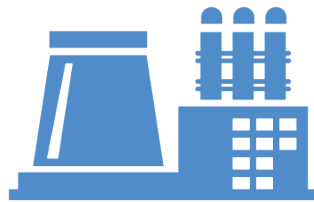
Why ICCS and Why Teesside?

Teesside is responsible for

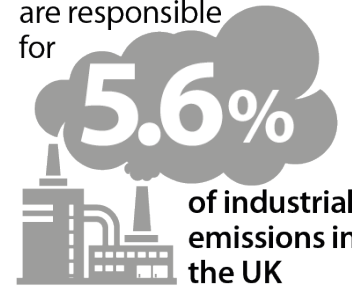


of the UK's chemicals industry

It has **Europe's 2nd largest blast furnace**

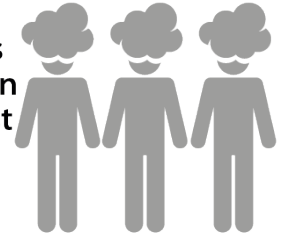


Teesside industries are responsible for



Regional emissions per person are almost

3x
the UK average



Teesside produces polyester resin for



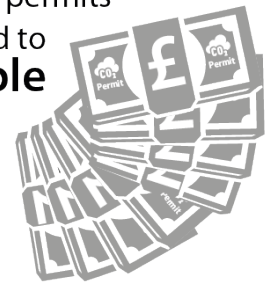
Northeast England process industries contributes



Teesside is home to



Costs of CO₂ permits are expected to **quadruple** by 2030



Key

- Existing Pipe Corridors
- Existing Tunnels
- Existing CO2 Exports
- Future CO2 Exports
- Existing Heat pipeline
- Future Heat pipeline

- Ports
- 1** New Energy & Technology Park (Enterprise Zone)
- 2** South Bank Wharf (Enterprise Zone)
- 3** Wilton (Enterprise Zone)

© Crown Copyright. All rights reserved LA100020967L 2014
 Tees Valley Unlimited
 © Copyright The GeoInformation Group 2014



Over £3bn investment over last 5 years

Company	Capex
SSI	£1.9 billion
Air Products	£600 million
Sembcorp and SITA	£200 million
SNF Oil & Gas	£150 million
BOC Linde	£100 million
Huntsman Tioxide	£65 million
Lotte Chemicals	£60 million

TeesValley
Unlimited


Department
of Energy &
Climate Change

BOC
A Member of The Linde Group


SSI UK

GrowHow

LOTTE CHEMICAL UK

nationalgrid
The power of action.


repic

Current status

- Received £1million from DECC, commissioned Pale Blue Dot, Soc Gen, Madano, and Amec Foster Wheeler
- Engineering now complete with cost estimates
- Business Case now in development
- Soc Gen developing a short list of funding mechanisms
- Brand, Name, Website and Twitter launched @TeesCollective
- Event in House of Commons and Knowledge Share at Wynyard Hall
- Ongoing dialogue with key influencers and conferences
- Commissioning economic impact assessment
- Launch of project in June / July

TeesValley
Unlimited

 Department
of Energy &
Climate Change

BOC
A Member of The Linde Group

 SSI UK

GrowHow

LOTTE CHEMICAL UK

nationalgrid
The power of action.

 repic

- Europe's second largest Blast Furnace
- Total site emits 7.1 million tonnes of CO₂ per year
- After optioneering 3 concepts selected for further study:
 1. Post combustion capture on the flue gas from new power station fueled by blast furnace gas – 1.6 million tonnes captured
 2. Pre-combustion capture from entire blast furnace gas – 2.1 million tonnes captured
 3. Pre-combustion capture from excess blast furnace gas and BOS gas – carbon converted to H₂ and CO₂ in shift reaction – 2.2 million tonnes captured

Tees Valley
Unlimited

Department
of Energy &
Climate Change

BOC
A Member of The Linde Group

SSI UK

GrowHow

LOTTE CHEMICAL UK

nationalgrid
The power of action.

repic

Growhow

- Produces CO₂ as part of process, sells to Greenhouses and Drinks industry
- Produces 950,000 tonnes CO₂ per year, average of 375,000 tonnes of CO₂ per year to be considered available for network
- New 100barg compression plant required (2 x 50tonne/hr compressors)
- Proven technology from existing suppliers
- No operation or integration issues identified

TeesValley
Unlimited

Department
of Energy &
Climate Change

BOC
A Member of The Linde Group

SSI UK

GrowHow

LOTTE CHEMICAL UK

nationalgrid
The power of action.

repic

BOC Linde

- UK's largest Steam Methane Reformer
- 305,000 tonnes of CO2 captured
- Conventional Amine Process on flue gas from SMR
- No significant impact on the hydrogen plant
- Significant power consumption – 5.9MW

Tees Valley
Unlimited

Department
of Energy &
Climate Change

BOC
A Member of The Linde Group

SSI UK

GrowHow

LOTTE CHEMICAL UK

nationalgrid
The power of action.

repic

Lotte

- Produces enough PET for 15 billion drinks bottles every year
- 50,000 tonnes of CO₂ captured
- Amine capture solution selected
- Pre-designed amine units available – American – no European pricing available
- 90% CO₂ captured

Tees Valley
Unlimited

Department
of Energy &
Climate Change

BOC
A Member of The Linde Group

SSI UK

GrowHow

LOTTE CHEMICAL UK

nationalgrid
The power of action.

repic

Onshore network

- 5 and 15million tonnes per year capacity pipe studied
- 100 barg from capture units with specified CO₂, transport at dense phase
- Constraints identified to generate route:
 - Environmental
 - NG NTS Feeder
 - Populations
 - Access to suitable shore landing
 - Rail and road crossings

TeesValley
Unlimited

Department
of Energy &
Climate Change

BOC
A Member of The Linde Group

SSI UK

GrowHow

LOTTE CHEMICAL UK

nationalgrid
The power of action.

repic

Offshore network

- Two destinations:
 - National Grid's 5/42 – 154km, 3 pipeline crossings, 3 communication crossings, 3 electrical transmission cable crossings, submarine exercise area. 5mt/yr = 18in. 15mt/yr = 24in
 - Shell's goldeneye – 433km, 4 pipeline crossings. 5mt/yr = 20in. 15mt/yr = 30in
- 5 components:
 - Booster station – PIG receivers, metering, booster pumps and PIG launcher
 - Onshore Horizontal Directional Drill to beach – cross under two natural gas lines to get to beach
 - Shore approach – pre-trench area to float the pipe to beach connection
 - Transport line – concrete coated, trenched and buried under 50m of water then laid on seabed
 - Delivery Termination – subsea isolation valve, riser to platform, PIG receiver, and metering

Tees Valley
Unlimited

Department
of Energy &
Climate Change

BOC
A Member of The Linde Group

SSI UK

GrowHow

LOTTE CHEMICAL UK

nationalgrid
The power of action.

repic

Funding mechanism

- Without a funding mechanism, such as the low carbon power sector has, this project is not viable
- EU ETS certificates are not bankable
- Industrial companies can close
- Clustering important to minimise individual credit risk and decrease infrastructure costs
- NER400 opportunity, especially for Transport and Storage for clusters
- Shortlisting of mechanisms being developed, two interesting options:
 - CfD covering extra cost of CCS - EU ETS price as base price, cost of CCS as strike price
 - Storage incentive, £//t stored received by storage provider
- Who pays?
- Transport and storage as part of Regulated Asset Base?



Tees Valley
Unlimited



Department
of Energy &
Climate Change



BOC
A Member of The Linde Group



SSI UK



GrowHow



LOTTE CHEMICAL UK



nationalgrid
The power of action.



repic

The plan to June

- Engaging more Teesside businesses in Teesside Collective
- Ramp up communications and profile – leading to public statement of support
- Produce the fully costed business case and execution plan
- Build consensus around the funding mechanism – banks, policy, EU
- Present the funding mechanism including strike price, impact of tax payers, how it will be funded
- Present the jobs figures and cost effectiveness figures against other low carbon technologies

TeesValley
Unlimited


Department
of Energy &
Climate Change

BOC
A Member of The Linde Group


SSI UK

GrowHow

LOTTE CHEMICAL UK

nationalgrid
The power of action.


repic

The plan post June

- Obtain a clear plan from Government to implement the funding mechanism
- Full project execution plan in development – key issues to consider:
 - Pre-FID costs and timetable
 - Storage and tariff negotiations with National Grid
 - NER 400 fund and bridging fund
 - Skills required by the project in the next development phase and internal project funding
 - Decisions by companies and commitment to continue support

TeesValley
Unlimited

Department
of Energy &
Climate Change

BOC
A Member of The Linde Group

SSI UK

GrowHow

LOTTE CHEMICAL UK

nationalgrid
The power of action.

repic