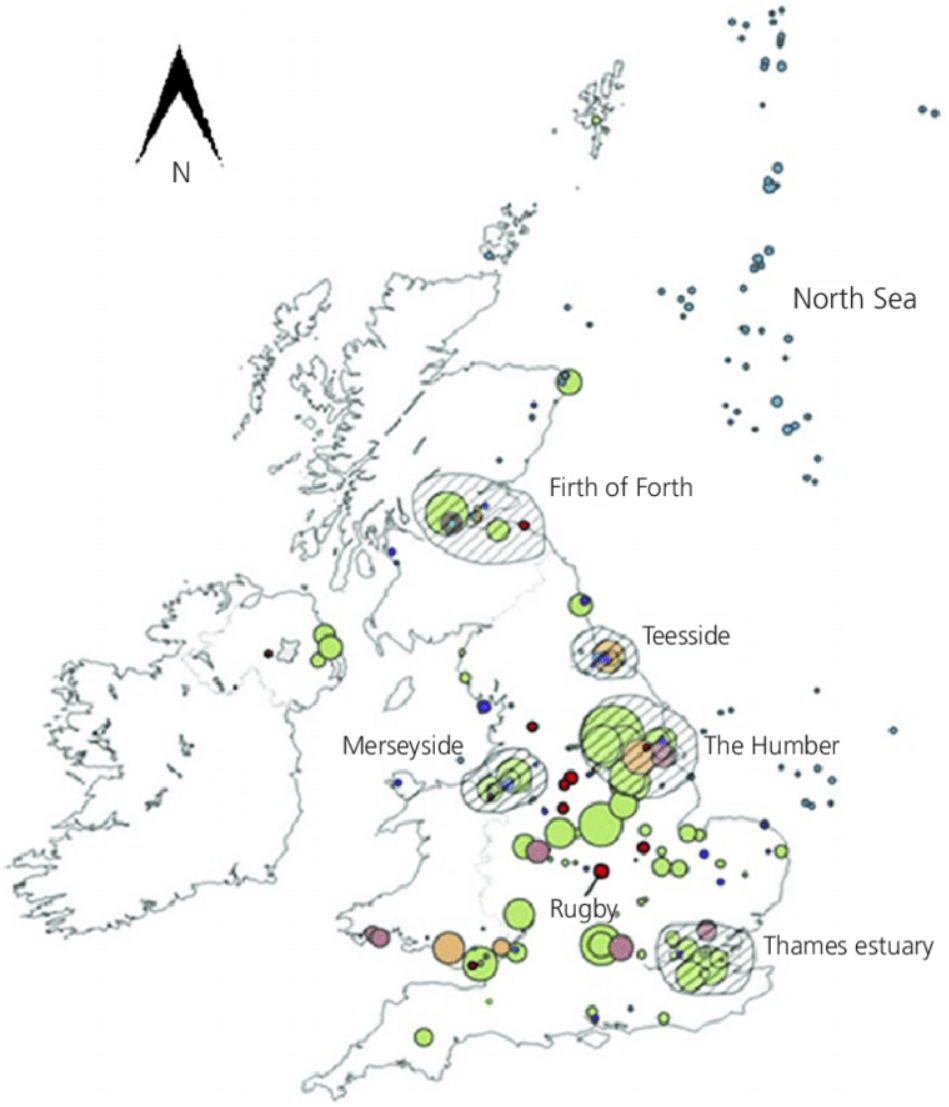
THE INFRASTRUCTURE FORUM

# Carbon Capture and Storage: Time for an ambitious leap forward




A paper for The Infrastructure Forum on the need for an ambitious introduction of CCS in the UK

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*As we emerge from lockdown, the public and private sector together have an opportunity to deliver an ambitious strategy to deliver Carbon Capture and Storage (CCS) in the UK. This is critical to delivering Government's Net Zero CO2 emissions target and meeting the wider social and strategic objectives of UK businesses, regions and workers.*

## Introduction

The next 18 months are set to be formative for CCS, as both the public and private sectors make key decisions on the breadth and extent of CCS investment this decade. The outcomes could range from one offshore $CO_2$ store and projects at one Industrial Cluster, to developing three storage regions that would underpin comprehensive decarbonisation of all of the UK's principal Industrial Clusters, together with the launch of a hydrogen economy, CCS power and Bio Energy CCS ("BECCS").

The latter outcome would require ambitious investment, and set the scene for competition, innovation and investment across the UK in projects to transition to a green economy.

*This paper considers key strategic reasons for adopting a clear, ambitious, public-private approach to CCS now, to create the building blocks of a new industry.*

## Matching policy and investment with the Committee on Climate Change's recommendations

The UN's Intergovernmental Panel on Climate Change (IPCC) has already recommended the introduction of CCS on a global scale.

In a linked paper to this one; **Carbon Capture and Storage – "A necessity not an option"**, I consider the potential for the introduction of CCS in the UK, and the reasons the UK's Committee on Climate Change ("CCC") describes investment in CCS as "a necessity not an option".

The CCC is a strong advocate for CCS, recognising its contribution to reducing emissions. Prior to the UK Government's commitment to achieving Net Zero by 2050, the CCC analysis had already suggested:

- between 75Mt-175Mt of $CO_2$ needs to be stored per year by 2050
- at least 10Mtpa needs to be stored by 2030, rapidly increasing thereafter

- delivering Net Zero requires large-scale deployment of CCUS for industry, power, Greenhouse Gas Removals/Bio Energy and hydrogen production

That level of the CCC's recommended ambition for CCS is expected to be increased in their 6th Carbon Budget, due by the end of 2020.

The CCC's existing scenarios already require that CCS deployment starts immediately with substantial deployment in all Industrial Clusters by the 2030s, with hydrogen having the potential to replace fossil fuel in areas where electrification may reach limits of feasibility and cost effectiveness.

Similarly, the BEIS Select Committee recently recommended that CCS projects should be commissioned in at least three clusters by 2025.

With this strong support for CCS, Government is actively developing its CCS strategy, developing the business models to underpin the industry and has launched the Industrial Decarbonisation Challenge Fund to provide funding for the development of Industrial Cluster decarbonisation plans and the Front-End Engineering and Design of the first schemes. In addition, the last Budget announced £800m further funding and long-term contracts to support a first wave of schemes. However, Government has not yet formally updated its ambition for the rollout of CCS since it revised its $CO_2$ target from 80% reduction in emissions to a commitment to Net Zero by 2050.

Without collective ambition and substantial finance from the private sector, the Government's current commitments will not be enough to deliver the CCC's existing and anticipated recommendations; Government and industry will be seen to lag behind what is required to achieve Net Zero.

*Key finding: The UK's targets for CCS need a step change in ambition to be consistent with achieving Net Zero. There is an opportunity, with committed joint investment, to deliver on those recommendations.*

## The UK can lead the world

The UK, as a leading Organisation for Economic Cooperation and Development (OECD) country, has a long-standing industrial history which means we have contributed disproportionately to Greenhouse Gas (GHG) emissions relative to our GDP. This fact, coupled with our being a relatively wealthy country on a per capita basis, has led the CCC to make the strong case that the UK should take the lead internationally in showing a path to Net Zero.

In November 2021, the UK will be joint-chairing the next global UN Climate Change Conference – COP 26 – where it will showcase its world leadership in renewables investment; particularly its huge success in wind.

The UK has the opportunity to further demonstrate its world leadership at COP 26 through its support of CCS and the adoption of hydrogen it enables, particularly because of:

- **Our technical and commercial advantages** - The UK has a series of natural and historic advantages (depleted oil and gas fields, a ready, developed supply chain, proven business models such as Contract for Differences (CFDs) and a regulated utility model suitable for CCS, a stable investment environment, and a clear political commitment to Net Zero) for it to showcase and lead the world in demonstrating CCS.

- **The European opportunity** – only a few European countries have access to significant stores for CCS. By advancing the development of CCS, the UK can become the preferred route for CCS sequestration across Europe; we can both help others decarbonise and share the cost of store development with them.

*Key finding: The IPCC has emphasised the need for CCS to combat climate change quickly and cost effectively. The UK can lead the world in demonstrating the deliverability of CCS, both technically and commercially.*

## CCS is the definitive 'green recovery' investment

As we emerge from a Covid-19 driven recession, Government has championed the call for green investment to stimulate the economy. Investment in CCS ticks all of the boxes:

- **Direct investment to achieve Net Zero** – Our five main Industrial Clusters emit over 30Mt $CO_2$pa in aggregate, where in large part those emissions can only be reduced using CCS
- **Retaining skills and repurposing assets -** If we act now to re-purpose assets, particularly oil and gas fields coming to the end of their life, we can not only avoid UK decommissioning costs but also retain associated skills and supply chains, redirecting those people and assets to CCS. Repurposing can become part of a just transition to a clean economy, ensuring skills are developed in the UK, not repeating the mistakes of previous industry

investment initiatives. The recent fall in the oil price makes the need to repurpose all the more pressing, before the fallout in jobs and skills in the oil and gas sector is more permanent

- **CCS investment will focus on key regional industrial hubs** – investment in CCS will be focused on key regions, preserving jobs and ensuring investment in industry, not city centres
- **CCS allows investment in green products** – both existing and new businesses will benefit from the ability to produce products with low carbon content immediately, ensuring the international competitiveness of existing businesses and attracting new regional investment from the UK and overseas

*Key finding: Investment in CCS is critical now to make the best use of an otherwise declining oil and gas sector, and will preserve jobs, and stimulate regional growth and investment in industry, including new international inward investment.*

## Offering CCS as a route to decarbonisation could be a huge opportunity for UK business

UK industry, in particular cement, steel and chemical sectors, are based at and around our Industrial Clusters. They underpin our economy with products for construction, infrastructure, plastics, fertilisers, soap, glass and pharmaceuticals, as well as delivering power and refinery products.

These industries currently carry exposure to uncertain future carbon pricing and emission trading, which is forecast to rise as we approach 2050 and possibly become more volatile. They can't pass these carbon taxes to consumers if their international competitors are not doing the same.

Industry's exposure to increasing, uncertain carbon pricing is a huge business risk; for many it is existential: can they continue to operate in the UK?

Without CCS, there is a risk that increasing carbon prices will simply drive business offshore to countries less invested in delivering Net Zero; ironically our increasing standards will lead to increased emissions as underlying products are offshored.

CCS offers a radical alternative.

We could choose to invest to enable businesses to convert to CCS, linking into a new CCS network at each cluster, with those businesses paying no more than they already pay in carbon offsets. Rather than a model that looks to push the cost of

CCS onto industry, who will struggle to pass to customers and remain competitive, CCS could be offered at modest cost, so that the cost of decarbonisation is shared across the economy rather than focused on those industries.

This approach can remove an existential risk from key industries. It would secure existing regional jobs, enable the production of green products and make the UK an attractive place to invest, because of the solution to carbon sequestration it offers business; attracting industries away from countries with no environmental solution.

The cost to the public purse would be outweighed by the impact on business competitiveness and the jobs it secures.

*Key finding: Introducing CCS at scale now, at marginal costs to business, can protect businesses against uncertain carbon prices, tariffs and legislation, ensuring international competitiveness, preserving jobs and encouraging new investment.*

## We are running out of time – why achieving Net Zero by 2050 needs a commitment to investment now

The CCC's target range for CCS capture of 75-175Mt $CO_2$ is hugely ambitious:

- Offshore wind took almost 20 years to scale to the stage where it was abating approximately 10 Mt$CO_2$ p.a.
- Individual CCS projects will take in the region of 5 to 7 years to develop, due to the time needed to develop designs, secure planning and consents, and to construct facilities
- The first wave of projects at the five main clusters probably will only deliver 10Mtpa by 2030 – even if all five are progressed now, we will only have delivered around 1/10$^{th}$ of the target in 1/3$^{rd}$ of the time between now and 2050
- Each cluster is made up of a large number of existing businesses, each of which will require its own contracts and projects put in place to introduce CCS, many of which will be delivered in sequence
- The five clusters emit only around 30Mt$CO_2$; even if we 'just' fully decarbonise cluster emissions, we will still be only at the low end of the CCC target range
- Wide-scale adoption of hydrogen beyond clusters to achieve the higher range of CCC targets will require new fleets of vehicles, industries to convert boilers and industrial processes, and the gas network to convert progressively to hydrogen

- These investments cannot be centrally delivered; they will require the development of a broad, competitive industry, finance and delivery capability
- To ensure learning by doing and the benefits of competition, as we saw in the wind and solar sectors, will require rounds of bidding in each sub-sector; by definition spaced out over time

A major benefit of CCS is providing Government with options to achieve Net Zero, effectively 'taking up the slack' by delivering power, hydrogen and negative emissions if other sectors are slow to decarbonise. This optionality presumes a well-developed network of stores and transmission of both $CO_2$ and hydrogen.

*Key finding: We are already on the critical path for delivering CCS targets. Only by starting the development of three storage regions and five clusters in the 2020s is it conceivable long-term targets will be met.*

## It's time to act strategically not tactically – can we deliver all 3 $CO_2$ stores and a Transmission and Storage (T&S) network in the 2020s?

There is a risk as we look to develop CCS over the next twelve months that companies and Government act purely *tactically*, focussing on narrow questions like 'how pots of money might be spent', 'which projects show quick wins', and 'how do I get my underlying project financed'?

But the real opportunity is to be *strategic* – for the public and private sectors to work together to deliver three storage regions and the T&S network necessary to underpin the rollout of CCS across all Industrial Clusters.

The delivery of all three storage regions and T&S network is important for several reasons:

### Demonstrating commitment

- A commitment to all three storage regions will be a huge signal of Government's commitment to the industry, rather than an incremental cautious approach
- The stores will not only enable the first wave of capture projects, but will signal the need for investment and planning for the next and subsequent waves, attracting global investors, innovation and building confidence in an industry

- Our commitment to three stores will signal to European partners the reliability of UK storage. The UK's capability could therefore be built into their decarbonisation plans; they could participate and contribute to the stores' funding and operating costs

**Diversifying risk**

- The three storage regions together will enable the decarbonisation of all Industrial Clusters, including $CO_2$ shipping from the Welsh and Southampton clusters, which cannot directly pipe into a store
- It will lower the risk of dependency on either one store or one source of hydrogen production as competing projects are developed at each cluster
- The regions of the three initial stores contain the bulk of the UK's storage capacity; the three initial stores can form the basis of a long-term integrated network

**Underpinning regional growth and cost efficiency**

- It will provide immediate green recovery stimulus in all 5 major Industrial Clusters, securing jobs across the UK
- A greater level of deployment will accelerate cost reductions as economies of scale are realised and CCUS projects de-risked
- By underpinning the leading five clusters, the approach will deliver the greatest cost benefits, through economies of scale and sharing of infrastructure, and joint planning and cooperation. Access to T&S at all clusters will enable subsequent competitions at scale for capture projects in funding rounds for power, hydrogen and industrial CCS projects; precisely the approach that has been successfully used by Government in the wind sector, with material reductions in the costs over time.
- Once the underlying T&S network is established, Government will have maximum control and optionality as to the speed, size and location of decarbonizing projects that require Government contracts. And the private sector can innovate and invest in projects that do not need Government support

While there are strong arguments for starting development at all three storage regions this decade, it should be acknowledged there is still much to do – designing the underlying business models, understanding the full costs and affordability not only of T&S but the first wave of projects that will need to be developed alongside.

While this understanding is being developed, and therefore the speed of rollout of CCS confirmed, it will be important to ensure all three storage regions are advanced through the Front-End Engineering and Design phase, right up to a possible Financial Investment Decision. This approach will continue the momentum in the sector, provide the analysis to underpin future investment decisions and keep our options open as to the scale and speed of investment thereafter.

*Key finding: Above all else, the public and private sectors should work together to complete the FEED for T&S for all three storage regions, preserving the option that all three could be then be developed in the 2020s. This in turn will give confidence to the industry, underpin the preparatory work on the anchor projects, and stimulate competitive and innovative investment across the UK.*

## Conclusion

The next twelve months will be formative for CCS in the UK. Over that time, we will decide the speed and breadth of how we might we transition to a CCS and hydrogen economy, the level of investment required and the speed of the decarbonisation it allows.

A UK-wide approach, that above all focuses on developing the three $CO_2$ storage regions in the 2020s and a first wave of projects across the 5 Industrial Clusters would be an ambitious way to launch the industry.

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## About the author:

For the past 4 years, Paul has been an independent infrastructure adviser, after over a decade in project finance banking and then 20 years as an infrastructure partner at PricewaterhouseCoopers.

He established and chaired the CCS Advisory Group and is now adviser to BEIS on the implementation of CCUS in the UK and a member of the Committee on Climate Change's industry decarbonisation policy steering group.

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