UNIVERSITY of STRATHCLYDE
CENTRE FOR ENERGY POLICY

IDRIC

Policy Brief

The importance of early employment and government revenue gains in governing the wider economy costs and benefits of deploying UK CCUS

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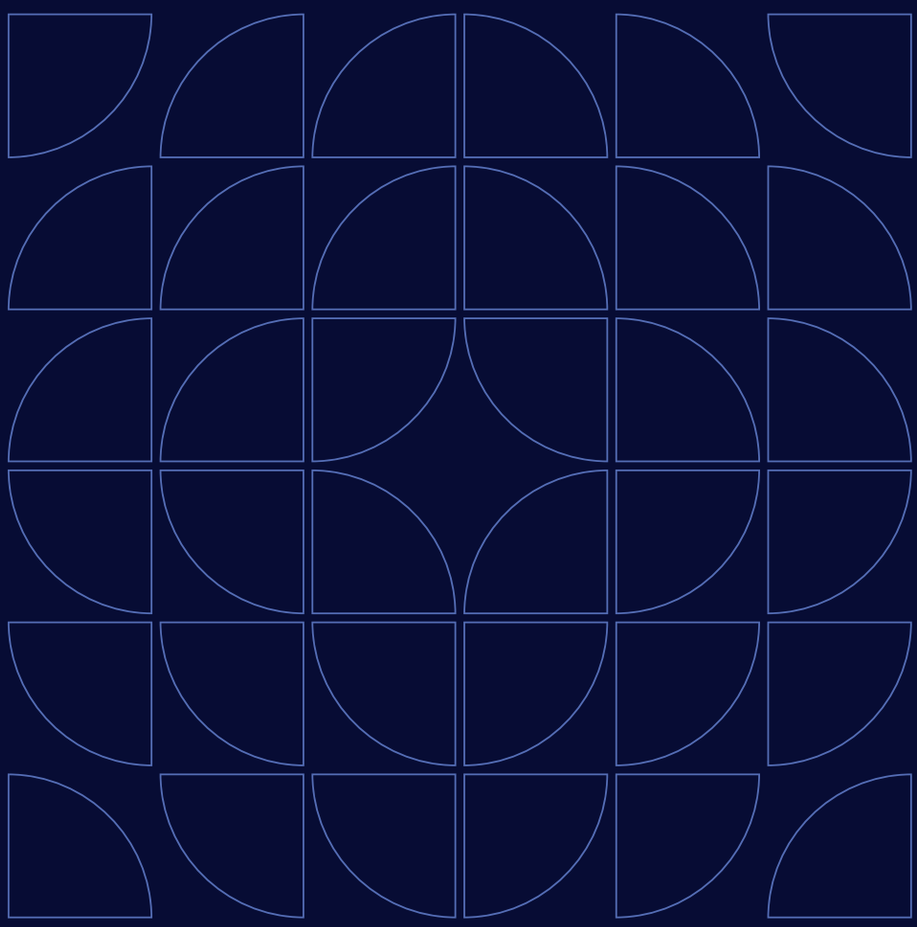
Summary of key findings

The opportunities to transition existing oil and gas industry activity and supply chain jobs to the operation of a new CO2 Transport and Storage (T&S) industry as a core part of UK Carbon Capture Utilisation and Storage (CCUS) have already been made clear in a number of government publications.[i] However, persisting worker and skills shortages in the UK labour market will constrain the extent of jobs supported and sustained GDP and associated revenue gains realised in practice[ii], and also bring challenges in terms of cost-effective CCUS project delivery in the crowded investment space between now and 2030.[iii]

Figure 1. Initial investment and returns related to supporting emergence of new UK CO2 Transport and Storage Industry with capacity to sequester 54Mt of CO2

Drawing on economy-wide scenario simulations to consider how actions to address the existing labour market shortages could affect the potential employment, government revenue and other macroeconomic impacts of deploying UK a new CO2 T&S industry, our main findings are as follows:

- An estimated £4.2BN of infrastructure investment activity to enable a new UK CO2 T&S industry built around the Track 1/2 clusters could generate net revenues of up to £2.6BN between 2023 and 2029. Net employment gains, peaking at 7,758 jobs in the first year of Track 1 infrastructure investment activity (assuming some action on skills development), combined with associated real wage rate and income gains, play an important role in increasing income tax revenues. By 2035, the operational T&S industry could support around 7,500 jobs.
- Despite continued wage-cost pressure, the total annual revenue gains exceed consequent Consumer Price Index (CPI) impacts on nominal government spending (up to £2BN between 2023 and 2029). Going forward, revenue gains play an important role in mitigating the net public budget implications of the UK Government directly supporting use of the CO2 T&S infrastructure from 2027 (when Track 1 becomes operational).
- CPI pressures could be further reduced, the economy moved more quickly onto a higher GDP and revenue generation trajectory, and 7.5K jobs associated with the operational T&S industry secured more quickly if labour supply constraints could be eased during the investment phase responding to spikes in labour demand in the UK construction industry up to 2029.
- Enabling in-migration to service construction demand requirements in this way during the infrastructure investment phase alongside action on skills could ease wage-cost pressure across the economy and limit displacement across other sectors from the outset.
- Generally, reducing early cost-price pressure to enable a more rapid adjustment of the economy will reduce the 'cost-per-job' to the public purse of supporting T&S related jobs.



Research and modelling approach

This report builds on the analyses detailed in a recent CEP briefing paper, where our focus was on estimating the total sustained employment across the UK economy of developing and operating CCUS networks. Here we focus in on employment impacts and net government revenue generation associated with the initial infrastructure investment activity required to deploy an operational UK CO2 T&S industry. This is with focus on servicing the sequestration needs of the clusters selected as part of the Track 1 of the CCUS rollout (Hynet in Merseyside and East Coast in the Teesside/ North Humber region) in UK industrial clusters and the identified frontrunners to be selected as part of Track 2 (the Scottish Cluster and the Viking CCUS in the South Humber region).[iv]

In the absence of detailed information on which emitters will be selected/respond within each cluster, we focus our scenario simulations on the investment activity and operation of the new UK T&S industry in terms of the potential to sequester all emissions within the actual Track 1 and potential Track 2 clusters, equating to approximately 54Mt of CO2 per annum. Table 1 summaries the key economic characteristics of the industry as we have considered it.

Table 1: UK regional cluster emission sources and interventions/impacts of linked CO2 Transport and Storage capacity

Key T&S industry investment and operational characteristics	Track 1 clusters only	Track 1 & 2 clusters
Total capital stock created (£m)	1599	3047
Pre-operation investment (£m) - Staged 10/20/30/40% over 4 years to 2026	2007	4210
Ongoing additional annual investment (£m)	240	431
Total output/demand serviced (£m)	553	994
Direct employment (FTE)	241	432
Value added (GDP) (£m)	349	627
Total industrial emissions serviced (Mt, millions of tonnes of CO_2)	30.60	53.84

In the absence of better information (at this stage), we assume that the new T&S industry shares the same supply chain structure as the existing oil and gas industry, albeit starting at a significantly smaller scale. We initially scale up the investment to develop the capacity to sequester the emissions of the Track 1 clusters by 2027, from which point the development of infrastructure for the Track 2 clusters begins until 2029; the full T&S industry becomes operational in 2030. For the timeframe we consider here (up to 2035), we assume the UK Government covers the T&S costs for emitting industries. Effectively, this means that Government starts purchasing T&S services of £553M from 2027, when

the network for the Track 1 clusters becomes operational, thereafter, once Track 2 also becomes operational increasing to £994M from 2030 to the end of the supported period (we assume 2035, though it may be longer).

Our scenarios

Our main focus in this brief is on the implications of different actions to ease the labour market pressures, reflected on the differences in the bargaining power that workers have to negotiate higher real wages. We consider three scenarios:

- Scenario 1: The central case in most of our economy-wide work where there are limitations in the availability of skilled labour (labour market constraints) that deliver bargaining power to workers to negotiate higher real wages.
- Scenario 2: As in scenario 1, the bargaining power of workers is reduced by around half as a result of, for example, actions to increase the number of skilled workers within the existing workforce.
- Scenario 3: In order to address the increased labour requirements, government allows a temporary in-migration of appropriately skilled workers in line with the temporal requirements of the 'Construction' sector until 2029.

We give particular attention to the period between 2023 and 2030 when the investment on the T&S infrastructure is taking place. We discuss the differences across the scenarios, on the economy-wide prices, reflected by the CPI, as they affect the broader economic results and key social challenges such as the cost of living. We also analyse the effect of prices on the government budget balance and therefore how different conditions influence the expected 'cost per job' associated with the development and operation of T&S in the UK.

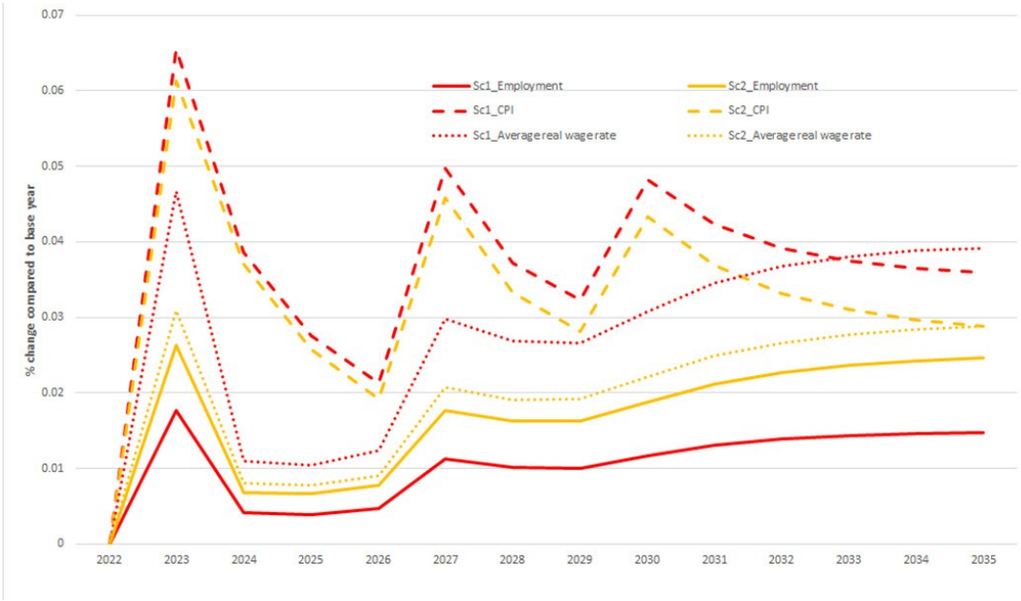
Types of wider economy impacts anticipated (Scenario 1)

Our most recent analysis revealed that the development and operation of a new T&S industry can drive a broader increase in economy-wide activity, resulting in GDP and net employment gains. This is assuming that the Government provides support to T&S users commensurate with guaranteeing demand for T&S industry output. Such wider economy gains are delivered despite constraints in the availability of appropriately skilled labour, particularly for the development of T&S networks, and the competition between different net zero projects over the same, finite, pool of skilled workers.

When we study the employment and government budget impacts under Scenario 1, we observe net employment gains across all timeframes, including the development period between 2023 and 2029, with the employment peaking at around 5,200 FTE jobs in 2023. Further analyses of the estimated employment impacts reveal that in the same year the most substantial labour demand is for over 11,100 FTE workers in 'Construction'. In the presence of the UK national labour supply constraint, this is the main driver pushing up labour costs and, consequently, prices across the economy. This leads to displacement of workers away from other, particularly labour- and/or wage-intensive sectors. One key outcome is upward pressure on the CPI which peaks in 2023 at 0.07%.

The increased economy-wide activity, and primarily the combination of higher employment levels and wage rates, enables a cumulative increase of the government revenue by £2.7BN during the development period, 2023-2029. On the other hand, the increase in prices across the economy (reflected in the CPI), means that the government needs to increase its nominal spending by £2.2BN in the same period, to cover the cost of its purchases and to maintain the real value of its transfers to households and firms fixed.

Figure 2: Impacts on UK employment, average real wage rate and CPI due to development and operation of a new CO2 Transport and Storage industry



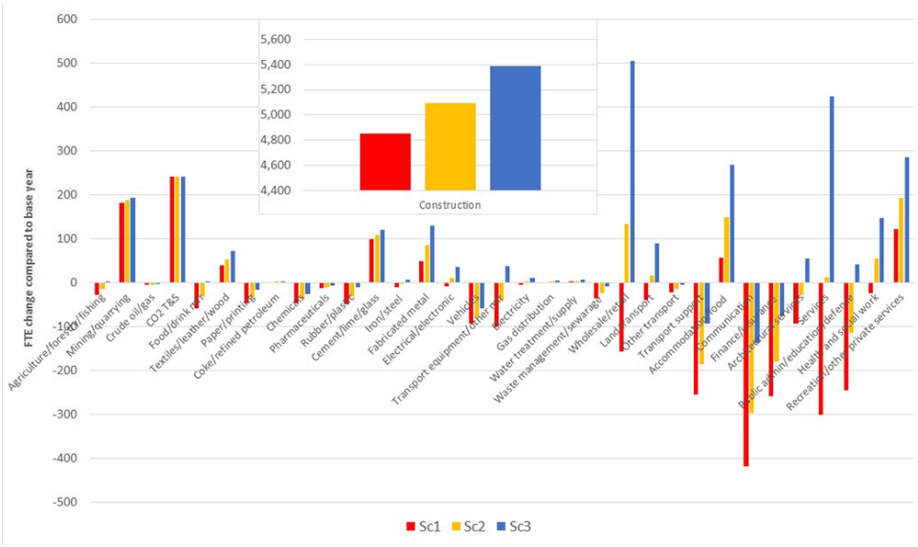
Looking beyond the development period, the operation of T&S ultimately drives net employment gains of 4,395 FTE jobs (0.02% increase, see Scenario 1 trend lines in Figure 2 and a wider increase in economic activity, which comes with a sustained increase in economy-wide prices (CPI) of 0.04%. The increase in prices, erodes some of the additional government revenue, meaning that the direct T&S government spending of £994M per annum in guaranteeing demand for T&S output (we assume here to 2035) is only partially offset, leading to sustained government budget deficit of £762M per annum. Essentially, we see that in Scenario 1 there is ultimately an annual direct 'cost per job' of £226K (based on the need to guarantee £994M of demand for T&S output), which falls to £173K if we consider the full public deficit impacts (where net real revenue gains partly offset the spending requirement and CPI impacts).

Even with labour supply constraints, positive employment and net revenue outcomes emerge from infrastructure development (based on Scenario 2)

While not fully eliminating the wage cost and price pressures affecting the Scenario 1 outcomes, it is possible to improve the economy-wide outcomes of T&S even in the presence of a national labour market constraint. Where there are significant shortages in specific skills, there can be organised government action to help support retraining/upskilling the work force. Crucially, if this can limit the extent to which workers moving from unemployment back into the labour force affects wage rates across the wider UK labour market consequent cost-price pressures and job displacement will be reduced.

To illustrate this point, Scenario 2 involves re-running our economy-wide simulation with just one change, halving the wage response as UK workers move out of unemployment. This may be a more realistic scenario where there is training activity, particularly in those sectors involved in the T&S rollout. This gives us the Scenario 2 outcomes in Figure 2, where the CPI pressure is reduced (peaking at 0.06% in 2023) while larger net employment gains (peaking at 0.03% or 7,758 FTE jobs in 2023) are realised. Essentially, easing the labour cost increases, helps mitigate or even reverse some of the labour displacement from the wider economy towards the sectors that are primarily involved in the development of T&S infrastructure (see Figure 3).

Figure 3: Impacts on sectoral (full-time equivalent, FTE) employment by 2027 of introducing the CO2 Transport and Storage Industry



The only negative trade-off is that, with reduced real wage rate increases (see Figure 2), the income tax gains are reduced relative to Scenario 1 (even with greater employment gains). Thus, despite the economy moving onto a better GDP trajectory, our simulations suggest that there would be a slightly smaller expansion in the cumulative government revenue of £2.6BN between 2023 and 2029 (compared to £2.7BN under Scenario 1). On the other hand, there is reduced CPI pressure on nominal government spending (which needs to increase by £2BN between 2023-2029, £200K less than in Scenario 1).

Moving forward towards 2035, the annual government deficit requirement in guaranteeing demand for T&S services is reduced to £715M, with a larger share of the £994M direct government T&S spending is offset. With greater employment gains, the direct 'cost per job' is reduced to £132K. However, considering the positive impact of reduced CPI pressure, the public deficit requirement per job is reduced by even more, to £95K per job. Therefore, if there is co-ordinated action to address the current skill shortages in the labour force, it becomes less costly for the government to support the creation of employment across the wider economy.

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Easing the overall labour supply constraint to address spikes in construction demand during the investment phase of T&S development could further relieve price and job displacement pressures (based on Scenario 3)

Wage-cost and price pressures, and associated displacement of jobs across multiple sectors, continue in Scenario 2 because the presence of a persisting constraint on the number of workers available to meet labour demand will generally trigger such pressures. Given the transitory spike in construction sector demand that is associated with the initial infrastructure investment activity to enable the deployment of UK T&S through Track 1 and Track 2, another policy option may be to allow in-migration of workers to meet this demand, which may or may not involve drawing on the already international labour force involved in oil and gas industry activity.

Thus, we have run one final scenario simulation where we retain the benefit of action on skills on reducing wage pressure introduced in Scenario 3 but introduce additional worker numbers mapping to the additional labour demand in the UK construction linked to Track 1 and Track 2 investment activity between 2023 and 2029.

The central finding is that employment gains increase, peaking at 12K FTE jobs in the first year. However, the employment gains are mostly associated with the in-migration (11.5K additional workers join the labour force in that first year). The crucial result is that there is a reduction in wage-cost pressure and consequent displacement of jobs in other sectors, generating the sectoral employment results reported for Scenario 3 in Figure 3 above. It also helps ease the CPI impact on the public budget, though (as in in moving from Scenario 1 to Scenario 2) easing the labour supply constraint in a way that limits real wage growth constrains revenue generation beyond the first few years of Track 1 investment activity.

Figure 4: Evolution of cost-per-job impacts of investing and operating a new CO2 Transport and Storage Industry (Scenarios 2-3)

On balance, however, if the additional job creation is valued, spreading the direct cost of supporting the T&S industry when Track 1 becomes operational in 2027 over more jobs does reduce the direct annual 'cost per job' by 32% between 2027 and 2029, with savings declining to around 3% by 2035 (once Track 2 is also operational). See Figure 4. If the total net public budget impacts are considered in calculating year-on-year annual 'cost per job' metrics, reducing the early CPI pressure and enabling a more rapid adjustment of the economy enables greater early reductions, equating to up to 36-37% between 2027 and 2029).

Conclusions and future directions

The central finding emerging from the initial analyses reported here is that easing the wage-cost impacts of persisting worker and skills shortages is crucial in maximising wider economy gains and reducing the cost to the public purse of supporting jobs associated with a new UK CO2 T&S industry emerging around the UK's Track 1 and Track 2 CCUS developments. We have demonstrated that, depending on what macroeconomic and employment indicators are of most concern to public policy decision makers, action to limit the dominance of wages in enabling increased employment may be as important as increasing the overall labour supply.

In further developing our work on this project, funded by IDRIC, and linked work on the Scotland's Net Zero Infrastructure project, we will be extending our scenario focus to better capture the regional cluster context of the UK CCUS rollout, with continued focus on the T&S element therein. We also aim to add more depth and detail to our study of the effect persisting UK labour supply constraints and skills shortages may have, and how these may be mitigated to allow greater employment, revenue and other economic gains to increase in all timeframes.

At this stage we invite input from our stakeholders both to better inform our scenarios and to explore what results and metrics would be most useful in informing the broader decision-making process.

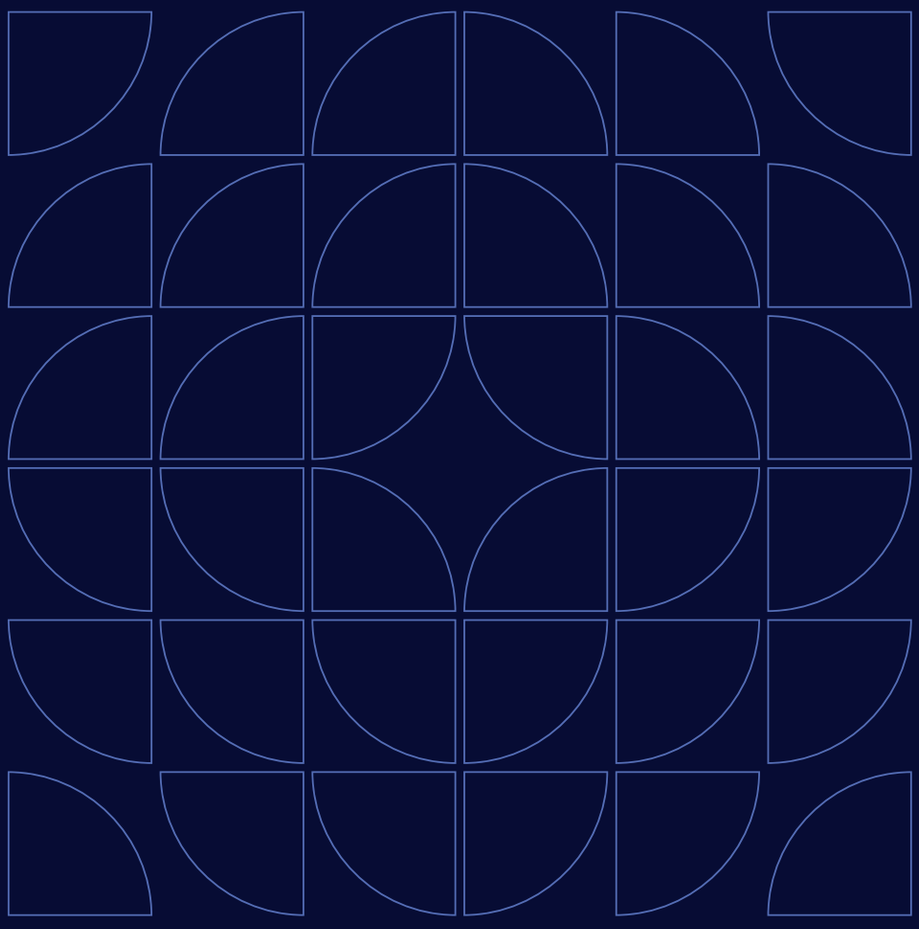
End notes

i See the UK Government's Carbon capture, usage and storage (CCUS) supply chains: a roadmap to maximise the UK's potential

ii Also see previous CEP research, summarised a policy brief published in February 2023.

iii Also see previous CEP research, summarised in a policy brief published in April 2022.

iv The 'Powering Up Britain' policy paper as well as the 'Track 2 guidance' identify the Acorn (the core of the Scottish Cluster proposal) and Viking CCUS as leading contenders to be selected as part of Track 2 and best placed to deliver on the Government's Track 2 objectives.



Acknowledgements and contact

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