



Policy Brief

Integrating CCUS services into the UK economy: the challenge of persisting labour supply shortages and constraints

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Summary

Greater understanding is urgently required as to how current and likely persisting labour market challenges may impact the deployment and operation of Carbon Capture, Utilisation and Storage (CCUS) projects across the UK's regional industry clusters. This is not only in terms of the timeliness of CCUS delivery, but the potential for net employment and GDP gains across multiple sectors, and how wage competition and bargaining may impact producer and consumer prices, competitiveness and the cost-of-living.

This is the first policy brief from a new project at the Centre for Energy Policy titled [CCUS and wage-driven employment displacement in a supply constrained labour market](#) (funded by [UKCCSRC](#)), which offers critical new insights into the nature and impacts of such labour market pressures. Work will be complemented and expanded through [LAB-CLUSTER](#) (funded by [IDRIC](#), due to start 2023) and existing work as part of [Scotland's Net Zero Infrastructure Programme \(Innovate UK\)](#).

We begin by considering how UK labour market challenges emerge from an effective national labour supply constraint, characterised by both skills and headcount shortages, which triggers wage competition across major Net Zero and other infrastructure projects, ultimately rippling out to affect all sectors of the economy. We then consider how these challenges manifest in the context of investing and deploying new CO₂ Transport and Storage (T&S) industry activity, linking some initial economy-wide scenario simulation work to the Track 1 clusters announced in late 2022.

The key initial finding is that, even in the current labour supply constrained conditions, an operational CO₂ T&S industry emerging from the CCUS Track 1 cluster projects could trigger 'green growth' in the form of a sustained GDP uplift of up to 0.03% per annum, and the creation of approximately 3,000 new jobs across the economy. Here, one positive outcome of wage competition and worker bargaining power is that increased real wage rates could enable a sustained increase in total real spending by UK households of up to 0.04% above what it would be with new T&S industry activity.

On the other hand, increased nominal wage costs faced by all producers reflects an increase in the cost-of-living and doing business in the UK, particularly during near-term investment phase, which we assume is concentrated between 2023 and 2026. During this timeframe, our scenario simulations suggest that increased cost pressures rippling out across the economy may trigger displacement of employment in multiple sectors. Moreover, we abstract from potential congestion of other Net Zero and other infrastructure projects, which could exacerbate both labour market challenges and impacts in the mid-2020s

Going forward, if the research is to effectively inform decision-making around CCUS rollout and Net Zero policy, including realising the potential for 'green job' creation, more widely, we need industry and policy experts input into developing the underpinning scenarios in four key areas: (1) sense-checking and improving information on the level and timing of investment to enable T&S industry activity; (2) project level insight on the likely impacts of current UK labour supply constraints; (3) intended capital stock/industry capacity; (4) potential for efficiency gains in T&S delivery over time.



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Introduction

In line with the [Ten Point Plan for Green Industrial Revolution](#), implementation of the UK Government's CCUS ambitions are progressing with Track 2 CCUS project decisions due to be made in 2023, underpinned by the evolution of the BEIS [CCUS business models](#). Securing and maximising project and wider economy benefits, with particular focus on the socioeconomic value of gross and net employment benefits delivered, will be critical if CCUS is to play a role in delivering the type of economically efficient transition to a net zero future set out in the recent [Skidmore 'Mission Zero' review](#). The [2018 CCUS Action Plan](#) has already set out UK Government focus on retaining direct and supply chain jobs supported by regionally clustered industries that can decarbonise by capturing CO₂. The specific role of CO₂ transport and storage in both enabling this and sustaining GDP and employment generation through transition of jobs currently linked to current Oil and Gas extraction and supply chains is also increasingly accepted. [Government analysis](#) suggests that the wider set of activities associated with deploying and operating CCUS in the UK could potentially support around 50,000 jobs by 2030. However, the [UK Government's Net Zero Strategy](#) also recognises that efforts to decarbonise the UK will put new demands and require significant changes in the UK labour market, with one in five jobs likely to be affected.

Crucially, persisting challenges around [labour market pressures](#), driven by skills and headcount shortages, coupled with consequent wage competition across major projects and sectors, demonstrate the need to consider the timing and magnitude of how potential gross employment gains associated with CCUS roll-out may be affected. This must be set in the context of understanding net employment outcomes, and related impacts on producer costs and consumer prices across the UK's regional and national economies.

A [new project](#) being carried out by the [Centre for Energy Policy at the University of Strathclyde](#), funded by [UKCCSRC](#), will fill a clear knowledge gap in this area, with focus on addressing the generic jobs 'additionality' and 'displacement' challenges that are always of concern in [HM Treasury \(HMT\) Green Book](#) approaches to assessing the economic benefits of any type of project. It is a relatively short-term project, ending in June 2023, but setting key foundations for other longer-term ones. It focusses on identifying and understanding the key drivers and mechanisms governing net employment, wage, and wider cost outcomes of investing in and delivering CO₂ transport and storage projects in different near, medium, and longer-term timeframes, thereby informing potential policy solutions to alleviate the impacts of persisting labour supply constraints and related cost/price pressures.

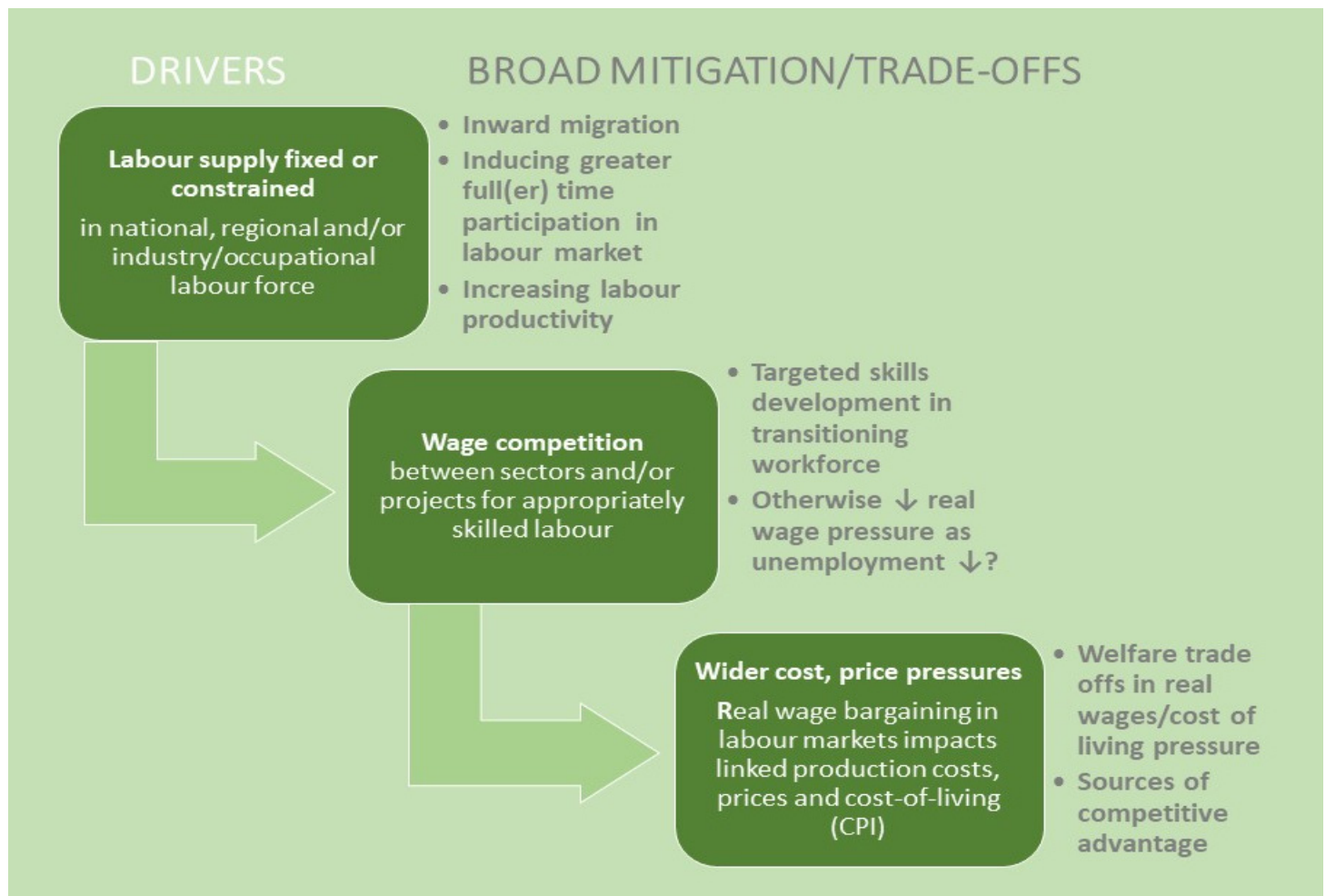
The aim of this first project policy brief is to set out the key drivers of cross-cutting labour market challenges and stimulate stakeholder engagement and discussion in the context of some early project results illustrating how worker shortages may impact in the context of deploying and operating new CO₂ T&S industry to support the UK's Track 1 CCUS cluster sequence projects.

What are the cross-cutting labour market challenges?

The fundamental issue for delivering on the full economic potential, including 'green jobs' creation, of the net zero transition is the persistence of labour supply constraints. The source of a range of challenges around whether workers with appropriate skills and expertise, will be available, at the right times and places, in sufficient numbers to service both net zero needs and the economic opportunities the transition offers. If not, it is necessary to consider what type of specific project delivery and wider wage pressures may result, and what the knock-on effects across the wider economy may be. Figure 1 summarises our assessment of the key drivers governing not only employment but associated cost and price outcomes that will ultimately wider economic performance and wellbeing.¹

Crucially, as in any market, where demand for labour exceeds supply, there will be price (wage) competition for appropriately skilled workers across projects and sectors. Moreover, where unemployment is low/falling, workers will have more bargaining power, focussed on their take-home wage. Rising wage rates will not only impact the costs of project delivery, which will impact the public purse/taxpayers where any extent of public funding is involved, as is the case with CCUS, unless efficiencies and sources of competitive advantage emerge as new industry activities roll out. However, at least in the near term, wage pressures will spill across sectors, and cost pressures will impact both the competitiveness of UK producers and the prices faced by UK consumers. Thus, a wider set of challenges and trade-offs are likely to emerge, not least in terms of impacts of the cost-of-living, which will erode any real wage and income gains accruing to workers and their households.

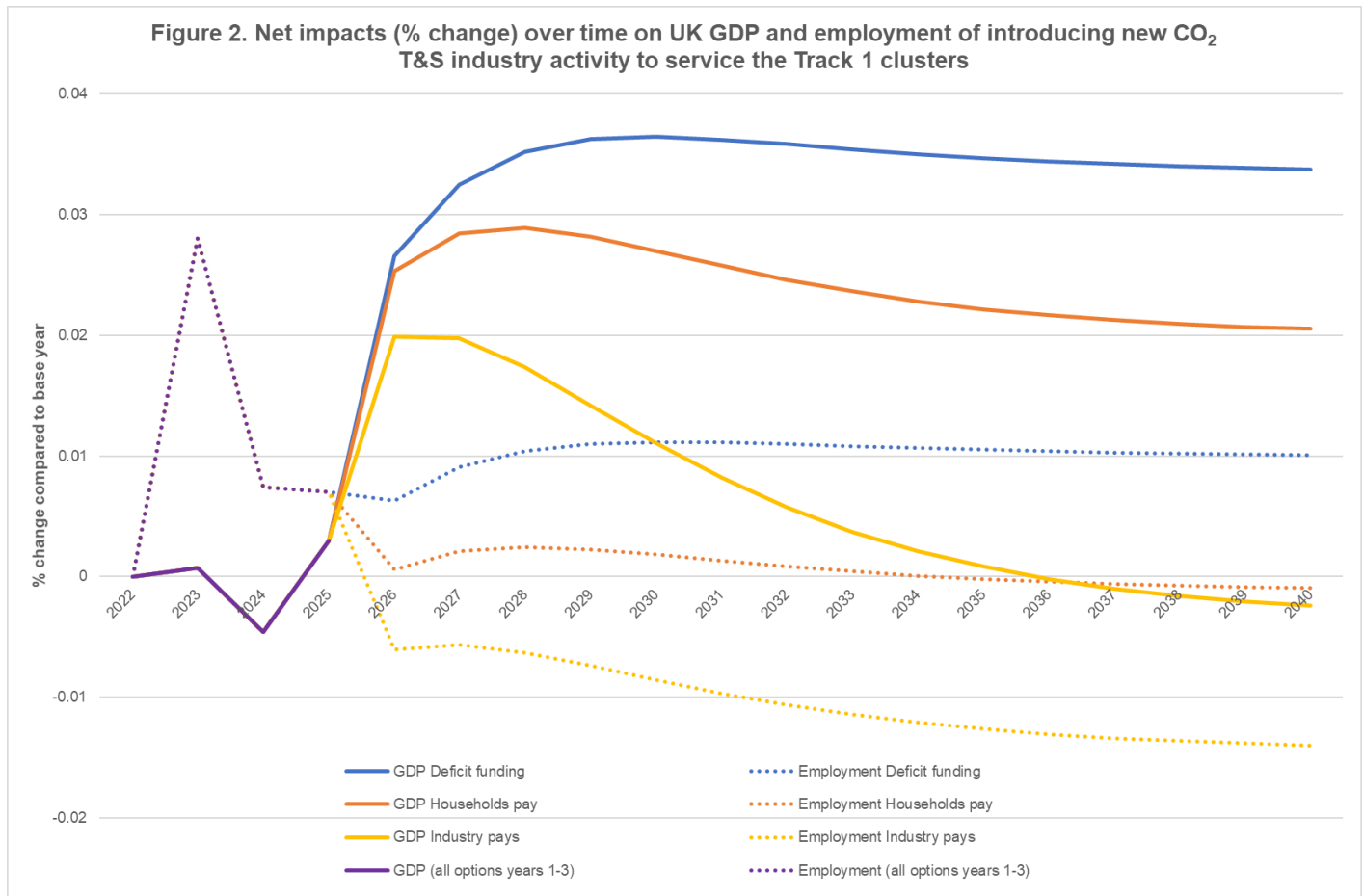
Figure 1. Key drivers and mechanisms governing employment, wage cost and other price outcomes affecting all sectors of the economy, workers and their households.



How are such labour market challenges and outcomes likely to impact the deployment and operation of clustered CCUS projects?

To illustrate the impact that the persisting UK labour supply constraint could have on the wider economy outcomes of investing and operating a new CO₂ T&S industry in the three Track 1 clusters announced in 2022, we have run some initial scenario simulations using our economy-wide model of the UK.² We have estimated that this will involve an upfront investment of £2.208million spread over the 3-year period between 2023 and 2025 to build capacity that supports an output/demand level of £662million per annum.³ The new T&S industry is operational from 2026, involving direct employment of 290 full-time equivalent (FTE) employees.

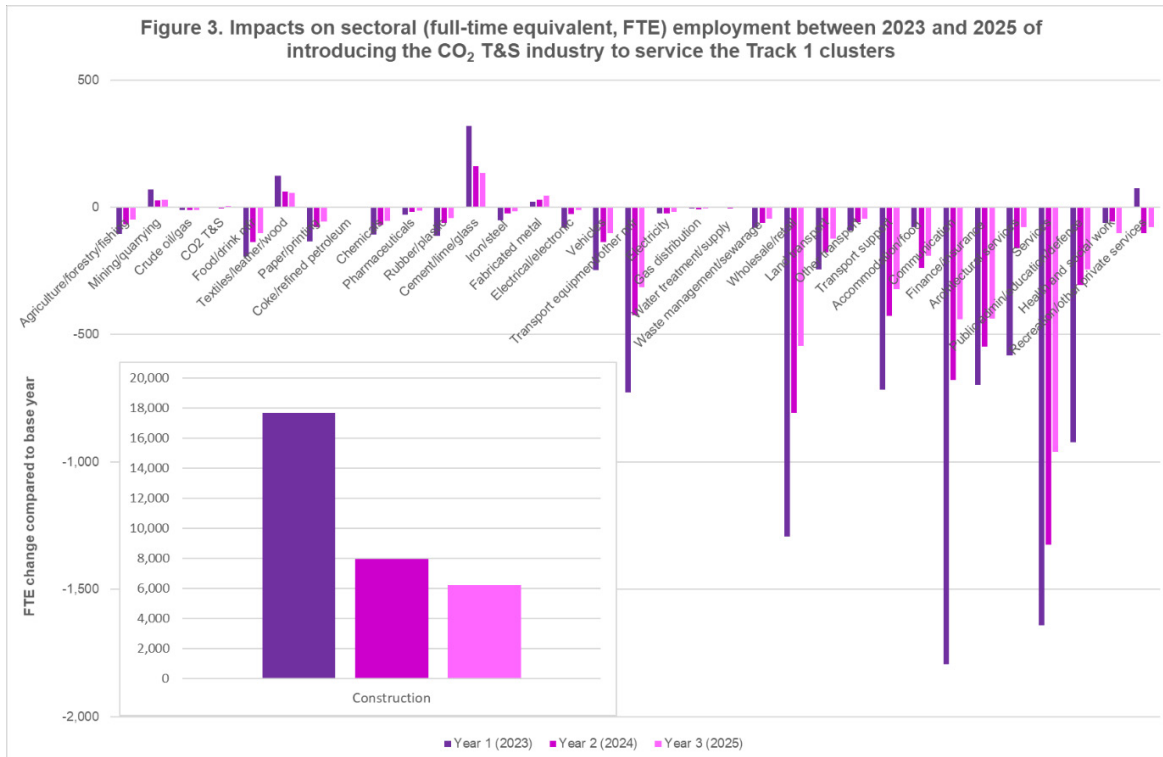
Our scenarios involve simulating the introduction of the new T&S industry activity (assumed to have a similar supply chain structure to the current UK Oil and Gas industry⁴) with no other changes in the economy. This allows us to isolate the wider sectoral and macroeconomic impacts, including those of the labour supply constraint. Figure 2 shows the trajectory of UK GDP and total FTE employment in addition to what it would otherwise be under different broad funding models.



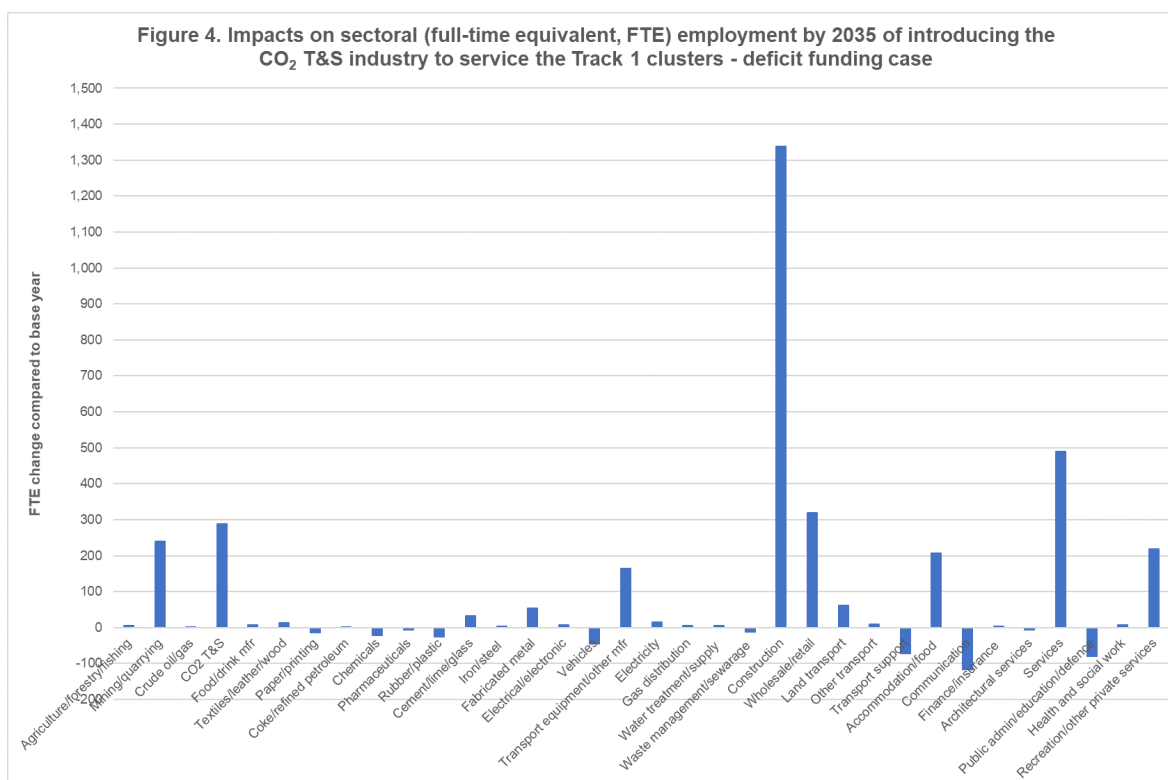
Thus, the key high-level finding is that deployment of CCUS as planned under Track 1 of the cluster sequencing process could indeed lead to ‘green growth’ associated with the introduction of new CO₂ T&S industry activity to the economy. The sustained GDP uplift could be 0.03% per annum, associated with a 0.01% increase in total employment (net creation of approximately 3,000 new jobs across the economy, including direct T&S employment). The underlying results show that this expansion is associated with a sustained increase in the consumer price index (CPI) of 0.02%, the average real wage rate rises by 0.03%, which combines with the increase in employment and other sources of income so that total real household spending across the UK rises by 0.04%. The only real ‘casualty’ of rising prices is total UK exports, which fall by 0.05%, so that the composition of GDP changes as well as rises.

However, the other cases in Figure 2 demonstrate that net GDP and employment gains could be eroded or entirely offset depending on how demand for the T&S capacity is funded/guaranteed. The blue-line trajectory cited above is one where there is no funding constraint and government fully guarantees the utilisation of T&S capacity through deficit funding. The other two cases shown are those where government transfers the burden to taxpayers (households) or those industries that could be direct users of the CCUS system.

The main focus at this stage is the impact of the labour supply constraint and associated wage competition and bargaining. Here, the key point is that the GDP and employment trajectories shown in Figure 2 are constrained relative to what they would be if there were no labour shortage and/or consequent wage and price pressures. Underlying the results above, from the outset labour supply constraints ‘bite’ from the outset, with a 0.18% increase in nominal wage rate faced by producers in 2023 when the increase in labour demand associated with new CCUS projects spikes. An associated 0.1% increase in the CPI means that average real wage rate gains are limited, also spiking in 2023 at 0.07%.



The key implication is that, for the employment required initially to deliver projects by 2026, then to operate the T&S industry going forward, increased wage costs triggers displacement of employment across many sectors of the economy. Figure 3 illustrates how the displacement process evolves in the initial investment period between 2023 and 2025, where the main driver is investment spending directed to the UK construction industry. Figure 4 illustrates the picture once the T&S industry is fully operational, when construction requirements are limited to supporting the operation of this relatively capital-intensive industry, with the key implication being that wage pressures and displacement of employment across sectors is more limited.





Conclusions

Thus, the main conclusion that can be drawn from the initial applied research reported here is that even constrained wider economy expansion or limited 'green growth' could be realised through the deployment of a UK T&S industry. Much will depend on just how the industry is funded and sources of demand going forward (and our research in the coming year will focus on such issues). However, generally, while UK labour supply shortages will impact through wage pressures and displacement of employment across sectors, negative pressures are limited where CCUS activity does not manifest as a substantial 'shock' in a limited timeframe. The main source of risk in this regard is relatively substantial near-term investment activity, where our analysis here abstracts from the additional pressure of other net zero and infrastructure projects planned during the remainder of the 2020s. In moving our research forward, through this project and others funded by IDRIC and Innovate UK, a key priority is to get expert stakeholder input in better informing our scenarios. At this stage, we identify four areas where industry and/or policy actors could provide new and/or 'sense check' the scenario information that CEP uses in economy-wide impact analysis (but welcome insight and input on others):

- 1. Level and timing of investment:** What level of upfront investment will be committed and how will it be spread over the timeframe between now and the mid-2020s to create the necessary capital stock/capacity in the T&S sector? What level and timing of investment to support different phases will interact across timeframes?
- 2. The impact of UK labour supply constraints on different CCUS projects:** How are current labour market conditions likely to impact both in terms of short-term or transitory disruptions to the economy and in delivery of the CCUS projects themselves? Has there been any consideration of how these challenges could be mitigated by extension of investment timeframes, and how would this trade-off against any impact on required timescales for enabled emissions reductions?
- 3. Capital requirements:** What will the additional capital requirements be for firms potentially involved in the uptake and operation of linked carbon capture in the Track 1 clusters, and the potential Track 2 ones? Specifically, what might the impacts be on the levels of capital/equipment required to capital efficiency and returns in different kinds of industry, and what may be the consequences in terms of the international competitiveness of these businesses?
- 4. Potential for efficiency gains over time:** Could time-limited public support enable capture firms to develop potential efficiency gains in using carbon capture equipment over time, and could this translate to potential 'early mover' competitive advantages for the UK in industry decarbonisation through CCUS?

End notes

1 See also the CEP policy brief published at <https://strathprints.strath.ac.uk/82451/>.

2 Details and previous applications of our multi-sector computable general equilibrium model of the UK (UKENVI) can be found via the CEP policy briefs at <https://strathprints.strath.ac.uk/79477/> and <https://strathprints.strath.ac.uk/80868/>. Fully peer reviewed research developing and applying the model in a scenario simulation context is available (open access) from [Ecological Economics](#) and several other journal papers (available on request from cep@strath.ac.uk)

3 We consider the necessary investment spending to get the clusters selected as part of Track 1 CCUS rollout - i.e., East Coast (including industries in the Humber and Teeside clusters) and Hynet (Merseyside cluster) projects - operational by 2026. We take our investment expenditure estimates from the work of [Calvillo et al. \(2022\)](#), which reports (Table 8) that the East Coast project would require approximately £1,472million additional capital to meet the demand of the industries in the cluster, while the Hynet project will require approximately £442million additional capital. We therefore simulate the introduction of £1,914million additional capital stock in the UK T&S sector, introduced through a total investment of £2,208million over a 3-year period 2023/2024/2025 in shares of 29%/34%/36%. Once the T&S sector has reached the planned capacity, an additional sustained investment of £287million per year is necessary to maintain the new and existing capital. Following the existing structure of the T&S sector the new capital is sufficient to support an annual output/demand of £662million.

4 See policy brief <https://strathprints.ac.uk/83228/>

5 See our paper published in [Ecological Economics](#) for a full analysis of funding model implications.

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