Green Industries Growth Accelerator: hydrogen and CCUS supply chains
Evidence submitted by the Centre for Energy Policy, University of Strathclyde
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RESPONSE

CEP's response focuses on the questions posed to non-manufacturers (19-21) and is based on our peer-reviewed evidence base on supply chains and the net zero transition.

19. GIGA Supply Chain Prioritisation.

a) Please provide detail of your view of where GIGA funding would be best targeted within the hydrogen and/or CCUS supply chain.

In developing the necessary supply chains for the effective deployment of nascent sectors, including carbon capture utilisation and storage (CCUS) and hydrogen, targeted funding will be required to address persistent skills and worker shortages. Our research has shown that if left unaddressed, these shortages could negatively affect project delivery and drive up costs for the wider economy. Without sufficient workers with the right skills, the potential economic gains associated with CCUS and hydrogen deployment could be constrained.

For example, our research finds that an estimated £4.2BN of infrastructure investment activity to enable a new UK CO_2 T&S industry built around the Track 1/2 clusters could generate net revenues of up to £2.6BN. Net employment gains, peaking at 7,758 full-time equivalent (FTE) jobs in the first year of Track 1 infrastructure investment activity combined with associated real wage rate and income gains, play an essential role in increasing income tax revenues. By 2035, the operational T&S industry could support around 7,500 FTE jobs and generate 1.15BN in GDP. However, these gains do assume some action on skills and worker shortages. Our analysis finds that without this action, job gains could be constrained to just under 4,400 FTE jobs (compared to 7,500) and 960M in GDP (compared to 1.15BN).[1]

Our evidence also highlights that understanding changes to labour demand and displacement of jobs will be critical to developing the necessary supply chains related to the deployment of CCUS in the UK. Analysis suggests that there will likely be transitory peaks in construction sector jobs associated with the establishment of a new CO_2 T&S sector, particularly during the investment phase, and in line with plans set out in the UK

[1] Turner, K., Katris, A., Zanhouo, A. Calvillo, C. and Race, J. (2024) Industrial carbon capture utilisation and storage in the UK: The importance of wage responses in conditioning the outcomes of a new UK CO2 transport and storage industry emerging in a labour supply constrained economy, Journal of Cleaner Production, Volume 434, 2024, 140084, ISSN 0959-6526. Available at: https://doi.org/10.1016/j.jclepro.2023.140084

Government's CCUS Vision.[2] . Our research finds that over 7,700 FTE construction jobs will be required in the first year of Track 1 T&S systems activity (Hynet North West and East Coast Cluster). Followed by a second peak of 6,700 FTE jobs as work starts on Track 2 (Acorn and Viking CCS). These peaks need to be considered in the context of projects taking place across the net zero space, where our research consistently finds increased demand for construction workers. These demands will need to be effectively managed, particularly against the backdrop of a tight labour market.[3]

20. Supply chain bottlenecks and barriers.

a) Please provide detail on your view of the key bottlenecks currently in the hydrogen and/or CCUS supply chains.

Our research suggests that achieving the UK government targets set in the CCUS Vision will require an understanding of the potential 'congestion effects' driven by competition for resources associated with rolling out multiple CCUS-related projects simultaneously against the wider backdrop of persistent worker and skills shortages and other net zero activity taking place. Combined, these could drive up project and broader net zero costs.[4]

In addition to the changes to labour demand highlighted in Q19, our research shows that certain regions not directly benefiting from hosting Tracks 1 and 2 Transport and Storage (T&S) systems will likely experience wage pressures due to the high demand for construction jobs in the hosting regions. These pressures can affect all sectors of the economy, with the construction industry experiencing a predominant increase in demand. The cost and price pressures driven by wages may lead to job displacement from other sectors, particularly those that are more wage- and labour-intensive, such as services and hospitality. Crucially, this leads to more significant regional net employment losses in the regions where these types of sectors are more prevalent, e.g., London and southern regions.[5]

Our analyses simultaneously simulates the staged introduction of all four Track 1 and Track 2 CO_2 T&S systems alongside analyses that simulates the introduction of each system individually and then sums the results. The simultaneous approach allows us to capture the dynamic nature and impacts of potential congestion effects in the supply-constrained UK economy. For example, in the simultaneous case, the anticipated transitory annual peaks in demand for constructions jobs associated with the Track 1 T&S systems rollout equates to circa 11,000 FTE jobs and around 4,200 FTE jobs with Track 2 T&S systems deployment. This compares to 7,730 and 6,700 based on individual analyses. These higher levels of employment demand where labour supply is constrained could lead to heightened

[2] UK Government (2023) Carbon capture, usage and storage: a vision to establish a competitive market Available at: https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-a-vision-to-establish-a-competitive-market
[3] Corbett, H., Calvillo, C. Katris, A., Gonzalez-Martinez, P. and Lucas, E. (2024) Providing certainty and acting with urgency – addressing skills and worker shortages for industrial decarbonisation. University of Strathclyde. Available at: https://doi.org/10.17868/strath.00088310
[4] Turner, K., Race, J., Katris, A., Calvillo, C., Zanhouo, A., Karkoutli, A., Corbett, H. and Swales, K. (2024) A new Scottish CO2 Transport and Storage sector: supporting decarbonisation, jobs and value across the UK economy. University of Strathclyde. Available at: https://doi.org/10.17868/strath.00088173
[5] Calvillo, C., Katris, A., Corbett, H., Race, J., and Turner, K. (2024) Policy brief: Understanding jobs demand and displacement outcomes of decarbonising UK industry clusters. University of Strathclyde, Glasgow. https://doi.org/10.17868/strath.00081951

competition for resources or congestion effects, which in turn could drive up wage costs and possibly limited economic gains and job creation. [6]

Our research shows that these congestion impacts will likely be time-limited and ease over time in the CO_2 T&S sector. It is worth noting thought that CO_2 T&S the sector represents a relatively small-scale investment and net zero activity, which we have analysed in isolation from the full range of other net zero activities likely to happen simultaneously (e.g., offshore wind, nuclear, and electricity network upgrades). For example, the investment levels we modelled for the CO_2 T&S sector involved totals of £3.2BN and £4.2BN between 2023 and 2029. [7] [8] This contrasts with an estimated £17.4BN investment in the hydrogen transmission network development by 2050 or £10.7BN to upgrade the electricity network to enable the electric vehicle rollout. Critically, the broader implementation of net zero activities within the same and/or similar timeframes could further increase and compound potential congestion effects, mainly if worker and skills shortages are not addressed.

Understanding and planning for these variations within the broader decarbonisation landscape is essential. Addressing these bottlenecks requires a concerted effort. Collaboration between governments, industries, and academic partners is crucial to identifying approaches to inform project sequencing and mitigate risks in workforce planning. This can be achieved by utilising frameworks like the Net Zero and Nature Workforce Action Plan and developing new ones with evidence-based mechanisms to incentivise optimal timing of actions.

b) To what extent could the costs of components across the hydrogen and/or CCUS value chains could be a barrier to deployment across the sector?

The cost of components across the hydrogen and/or CCUS value chains could pose challenges in relation to deployment by driving up project costs and costs to the wider economy. In turn, these could have an impact on UK industry competitiveness and the cost of living due to businesses passing on the cost of products to consumers.

Our research finds that the magnitude and distribution of costs and benefits emerging across the economy in relation to a CO_2 T&S sector deployment depends on how the government covers its T&S expenditure, and there are some crucial trade-offs. For example, a public deficit funding option delivers the best economy-wide outcomes at the expense of an increased budget deficit, while an ‘industry pays’ approach could lead to an economic contraction and net employment losses, particularly in regions where UK Government is

[6] Corbett, H., Katris, A., Calvillo, C. and Gonzalez Martinez, P. (2024) Driving effective workforce planning and project sequencing to aid efforts to decarbonise UK industry clusters and boost associated economy wide impacts. Available at: https://doi.org/10.17868/strath.00088667

[7] Turner, K., Katris, A., Zanhouo, A. Calvillo, C. and Race, J. (2024) Industrial carbon capture utilisation and storage in the UK: The importance of wage responses in conditioning the outcomes of a new UK CO2 transport and storage industry emerging in a labour supply constrained economy, Journal of Cleaner Production, Volume 434, 2024, 140084, ISSN 0959-6526. Available at: https://doi.org/10.1016/j.jclepro.2023.140084

[8] Corbett, H., Katris, A., Calvillo, C. and Gonzalez Martinez, P. (2024) Driving effective workforce planning and project sequencing to aid efforts to decarbonise UK industry clusters and boost associated economy wide impacts. Available at: https://doi.org/10.17868/strath.00088667

looking to address persistent regional inequalities through its levelling up strategy. [9, 10, 11] UK Government has committed to funding CCUS deployment up until 2035, with ambitions that after that period, the market will become self-sustaining. However, the issues highlighted here will need to be considered as part of post-2035 planning, and as the sector continues to establish itself.

There are also important trade-offs to be recognised in terms of importing supply chain components (both products and workers) from abroad. This could potentially lead to the offshoring of jobs, investment and emissions and needs to be considered in relation to 'local content' commitments. This could have important consequences for 'Just Transitions' and levelling up policy agendas as well as the UK's overall positioning in an increasingly competitive global environment characterised by mechanisms such as the US Inflation Reduction Action and the European Union Green Deal.[12]

c) Are there any other key supply chain barriers you think will harm deployment across the hydrogen and/or CCUS sectors?

The development of adequate supply chains to enable the effective deployment of nascent hydrogen and/or CCUS sectors will be aided by the design and development of a number of overarching policy frameworks, including a refreshed UK industrial strategy and the new Net Zero and Nature Workforce action plan. Based on our research findings that demonstrate the need to manage 'congestion effects', avoid the risk of 'offshoring' jobs and investments and maximise economic gains, these frameworks could facilitate more effective targeting of resources based on agreed set of priorities and areas of competitive advantage. This will be essential with multiple net zero projects coming online alongside CCUS and hydrogen, including renewables, new nuclear and upgrades to various networks and infrastructure, with competition for a limited pool of resources growing, both within the UK and globally.[13]

It is also essential that UK Government take pressing decisions around the role of hydrogen in the net zero transition. Our research, undertaken for and cited in the Second National Infrastructure Assessment,[14] highlights that these decisions will influence and enable a fuller picture of the demand profile for the hydrogen sector to emerge and ensure that the capacity created is effectively utilised.

21. UK supply chain capability and capacity.

a) Please provide detail of your view of any components in the hydrogen and/or CCUS supply chains where the UK holds significant capacity and/or capability.

In developing CCUS supply chains and deploying this nascent sector, there is the opportunity to draw on existing infrastructure from within the oil and gas industry. Our

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[9] Turner, K., Stewart, J., Katris, A., Race, J., Alabi, O. and Calvillo, C. (2021) Moving early in Carbon Capture and Storage: Opportunities and Challenges for Delivering Green Growth and Just Transitions. University of Strathclyde. Available at: https://doi.org/10.17868/78347

[10] Turner, K., Race, J., Alabi, O., Calvillo, C., Katris, A., Stewart, J., & Swales, K. (2021). Could a new Scottish CO2 transport and storage industry deliver employment multiplier and other wider economy benefits to the UK economy? Local Economy, 36(5), 411-429. https://doi.org/10.1177/02690942211055687

[11] Turner, B. K., Race, J., Alabi, O., Calvillo, C., Katris, A., & Swales, K. (2022). Policy trade-offs in introducing a CO2 transport and storage industry to service the UK's regional manufacturing clusters. Ecological Economics, 201, 107547. https://doi.org/https://doi.org/10.1016/j.ecolecon.2022.107547

[12] Turner, K. The risk of 'offshoring' emissions, jobs and investment. Available at: https://www.strath.ac.uk/humanities/centreforenergypolicy/newsblogs/2021/offshoringrisk/

[13] Corbett, H. and Fonseca, L, (2023) Investing in a skilled workforce for a just net zero transition. Available at: https://doi.org/10.17868/strath.00088656

[14] National Infrastructure Commission (2023) Second National Infrastructure Assessment. Available at: https://nic.org.uk/studies-reports/national-infrastructure-assessment/second-nia/

research suggests that given the similarities in skills and supply chain requirements across oil and gas and the CO_2 T&S sector, there is the potential to ease labour market and other capacity challenges to provide decent well-paid jobs, particularly as capacity requirements for oil and gas reduce. However, our analysis also shows a potential mismatch of timelines for the CO_2 T&S rollout and oil and gas capacity freed up, where the pace of decline in the latter is relatively slow in this timeframe. Thus, other strategies will be required to address worker availability and wage cost challenges associated with the emergence of a UK CO_2 T&S sector linked to industrial decarbonisation.[15]

The existing O&G infrastructure could also assist the UK in developing a competitive advantage in relation to the rollout of CCUS through developing an export market, which could support jobs and generate GDP. For example, our analysis shows that if the Scottish CO_2 T&S sector (Acorn) is able to expand its capacity to transport and store overseas emissions (via shipping) the number of full-time equivalent (FTE) jobs supported by the sector across the wider UK economy could increase (relative to only piping Scottish cluster emissions) by 62%. Increasing from 765 to up to 1,236 FTE jobs. The Gross Value Added (GVA or GDP) supported could also rise by 56%. Increasing from £167M per annum (p/a) to £261M p/a. Moreover, the costs to the public purse of supporting CCUS in the UK will be reduced. This is achieved through a £55M boost to government revenue gains associated with exporting T&S services abroad, without any additional domestic public spending requirement.[16]

[15] Katris, A., Turner, K. and Corbett, H. (2024) *Assessing the role that a CO2 transport and storage sector could play in transitioning away from oil and gas extraction in the UK.* University of Strathclyde, Glasgow. Available at: https://doi.org/10.17868/strath.00088382

[16] Turner, K. Katris, A. Corbett, H., Race, J., Zanhouo, A. and Karkoutli, A. (2024) *Boosting UK-wide value-added and employment without further demands on the public purse: the advantages of developing an export base for Scottish CO2 Transport and Storage.* University of Strathclyde. Available at: https://doi.org/10.17868/strath.00088311