

**Written evidence submitted by Professor Karen Turner and Gareth Johnson on behalf of the Centre for Energy Policy, University of Strathclyde – (DUE007)**

**Executive Summary**

- Generally, the key insight of our research concerns the need to broaden attention from technology and cost considerations associated with low carbon developments. Instead, there is a need to focus on the potential for low carbon initiatives to unlock, sustain and increase value in different parts of the economy as we transition to a low carbon future.
- For example, our recent EPSRC National Centre for Energy Systems Integration (CESI) research on the impacts of network upgrades to support a projected 20% penetration of EVs by 2030 is likely to have a net positive outcome on the UK economy, including up to 3,000 new jobs across a range of sectors. The main driver may be strong UK supply chain activity driven by powering vehicles with electricity.
- A second example emerges from recent research funded by Scottish Enterprise, which focussed on how establishing a large-scale CO<sub>2</sub> management industry could mean an alternative and new use for the capacity, infrastructure and workforce traditionally associated with Scotland's oil and gas industry. The shift in this capacity has already begun through the offshore renewables sector. Our initial estimates suggest that by 2030 anywhere up to 45,000 UK jobs could ultimately be associated with Scotland securing 40% of the carbon storage element of a European CO<sub>2</sub> management market. By 2050 this could rise to 105,000 jobs, and more as the industry extends to low carbon fuel supply.
- The particular potential for Scottish capacity in providing CO<sub>2</sub> management services combines with the need to consider how industrial decarbonisation can be achieved in a way that allows our high value manufacturing clusters continue to operate (and potentially grow). These are crucial considerations for how the UK may achieve a just and regionally balanced transition. This not only concerns energy intensive industries such as petrochemicals but the supply chains and jobs they support across the UK (e.g. 3 indirect supply chain jobs are supported for every direct job in petrochemicals).
- Attention to jobs is crucial in considering a 'just transition', which is not just about considering the distribution of impacts; it creates the societal permission from the people of the UK for the chosen approach(es) to delivering net zero ambitions.
- The need to carefully consider the role and functioning of green finance also becomes crucially important in a just transition context as it will ultimately be consumers and/or taxpayers who pay for the chosen path and portfolio of activity. Government's main roles may be in considering how to reduce risk (and thus costs) to actors, playing a role in ensuring appropriate finance mechanisms are available.
- All of this must be alongside identification of approaches by which the type of wider economy returns set out above may be maximised. For example, we identify energy efficiency as a key route to generating net economy-wide benefit, but the specific outcomes depend crucially on how actions are financed.

## **Introduction to the Centre for Energy Policy (CEP) at the University of Strathclyde**

The Centre for Energy Policy (CEP) was established in 2014. CEP is multi-disciplinary hub that facilitates research, knowledge exchange and policy engagement on energy policy issues affecting low carbon economic development by bringing together local, regional, national and global expertise. It conducts research into all forms of energy, looking from a number of angles in order to be the independent “go-to body” for Government and a key contributor internationally on energy policy. Uniquely, the Centre offers a ‘wider view’ of energy policy, going beyond technology-driven analyses to consider the whole economic, social and political context of energy decision making. In particular, the Centre considers how energy policy, industry and use impact the wider economy, how and where value is generated and to which sectors and regions it accrues. As academic researchers, we publish regularly in international peer reviewed journals, but produce non-technical policy briefs throughout the progress of our work, and in response to a range of Government Inquiries.<sup>1</sup>

This has allowed us to engage at Scottish and Westminster levels within the UK, for example through societal value propositions around CCUS initially explored through 2017/early 2018 with BEIS and subsequently contributing to the Cost Reduction Task Force report development. Subsequent to this, in 2018-2019 we have worked with Crown Estate Scotland (CES) and Scottish Enterprise to extend the debate around CCUS from its current focus on technology and cost reduction to consider instead the value across the economy of creating a large-scale CO<sub>2</sub> management industry. We are currently collaborating with BEIS on an EPSRC Impact Accelerator project focussing on how wider economy and key macroeconomic gains result from ECO-financed energy efficiency programmes. We have also recently collaborated with SP Energy Networks in developing industry understanding of the wider social costs and benefits of their investment activity to upgrade the electricity network to support the EV rollout to 2030.

The CEP Director, Professor Karen Turner, currently serves on the Scottish Just Transition Commission. She has recently completed her service on the Royal Society of Edinburgh’s Inquiry on ‘Scotland’s Energy Future’ and the Costs and Benefits Advisory Group to the Committee on Climate Change (informing the May 2019 CCC Net Zero report). She is currently leading an economics sub-group of the Royal Society (London) project on the ‘Long Term Role of Energy Storage’.

All of our activity is supported by CEP’s advisory board, chaired by Ian Marchant (former CEO of SSE), which inputs to all CEP activity in terms of direction and research focus with representation from all parts of energy industry such as Renewables, Energy Providers, Oil and Gas as well as representatives from Government and the academic world.<sup>2</sup>

In submitting to this inquiry, we have decided to concentrate on several key points that may not emerge elsewhere. Specifically, our expertise and insight from our research activity focuses on the first three questions around ‘The economic opportunity’ of decarbonisation. Our work generally focuses on the need to tackle CO<sub>2</sub> emissions at source within the UK ~~while retaining (and potentially growing) jobs, production activity and GDP in our energy~~

<sup>1</sup> For example, see <https://strathprints.strath.ac.uk/53933/> on security of energy supply; <https://strathprints.strath.ac.uk/58187/> on shale gas; <https://strathprints.strath.ac.uk/60516/> on future of natural gas in the UK; <https://strathprints.strath.ac.uk/63554/> on CCUS.

<sup>2</sup> The research underpinning this submission is and has been supported by the EPSRC (Grant references: EP/M00760X/1 and EP/JO16454/1) Crown Estate Scotland, Scottish Enterprise, UKERC and the UKCCSRC.

supply sectors, energy-using industries and the domestic oil and gas industry. However, it also extends to the role of the wider UK supply chain that supports, and can further support activity in all of the aforementioned industries where decarbonisation activity more traditionally focusses.

## **Full Submission**

### **THE ECONOMIC OPPORTUNITY**

#### **Question 1: What economic costs and benefits does decarbonisation present for the UK?**

1. At CEP we investigate the wider economic costs and benefits of different actual and potential decarbonisation actions using the type of multi-sector economy-wide computable general equilibrium (CGE) model as used by HM Treasury to simulate different scenarios under different conditions. This allows us to consider questions such as 'who ultimately pays' (through bills/taxation but also through income and price effects throughout the economy) and to identify which sectors may expand or be 'crowded out' particularly through supply chain effects of changes in the composition of production and consumption.
2. The decarbonisation activity perhaps most likely to generate net positive benefits to actors directly involved and the wider economy is increasing energy efficiency. This has been the focus of the International Energy Agency's 'Capturing the Multiple Benefits of Energy Efficiency Programme' ([IEA, 2014](#)), with which CEP has been involved since 2014. Our own work has shown that increasing the efficiency with which UK households use energy can deliver a sustained boost to GDP of around 0.16% ([Figus et al., 2017](#)).
3. More recently, we have begun to investigate how the predicted rapid expansion in electric vehicle (EV) ownership over the next decade may impact the wider economy ([Turner et al., 2019a](#)). We have focussed on how this will shift demand away from vehicles fuelled with petrol and diesel and will require upgrades to the electricity network itself. This will carry significant costs that are ultimately paid by consumers both through their energy bills and the costs of other goods and services where electricity prices impact production costs. Large-scale investment can also be disruptive to the wider economy. Our results suggest that costs to consumers and the wider economy can be minimised if investment activity is planned and spread evenly in the years ahead of EV demand fully materialising. The risks and uncertainty involved should be set against the likelihood that the net outcomes enabled by EV outcomes may be positive due to a broad set of economic benefits, including up to 3,000 new jobs associated with 20% EV penetration by 2030. These jobs would be spread across a wide range of UK sectors, with the main driver being strong UK supply chain activity driven by powering vehicles with electricity that replaces highly import intensive petrol and diesel.
4. Generally, there is a need to conduct tailored economy-wide impact analyses of all decarbonisation solutions in order to properly assess what the net costs and benefits may be, and to identify any sectors that may lose or be 'crowded out'. However, this

may not hold as the rollout builds pace and demand expands as price impacts could be more extensive. In the case of EVs, we find that ultimately only petrol and diesel supply ultimately loses out. However, in the case of residential energy efficiency, increased household income and expenditure does raise price levels and more export-orientated sectors can be 'crowded out' as domestic demand drives GDP expansion.

**Question 2: What benefits can a growth of the Green Finance sector deliver for the UK, and does the UK hold a competitive advantage in this space?**

5. As noted above, the approach to finance is crucial in enabling affordable decarbonisation that delivers net benefits to the wider economy. However, it is also crucial to consider the ultimate distributional impacts of any action. This is particularly relevant where costs will ultimately be passed on, particularly to vulnerable consumers/households, through energy bills. Ultimately, any costs borne in any sector will be felt in prices both of that sector's output and rippling through forward supply chains and factor markets.
6. We have just begun a programme of UKCCSRC funded research on the topic of 'The Role of CCUS in Industry Clusters in Delivering Value to the Political Economy' ([Turner et al., 2019b](#)). We will be exploring the question of how a 'polluter pays' approach to financing CCS may negatively impact the wider economy through impacts on competitiveness effects. In previous work ([Turner et al., 2018a](#)), we began to consider how price impacts may transmit. For example, if CCS is introduced in the petrochemicals industry, the main direct price pressure would be anticipated through the output price of that industry. However, this would trigger negative competitiveness impacts on export prices (around 2/3rds of the UK petrochemical industry's output is exported). Of course, this assumes that petrochemical producers are able to pass on costs through their prices. The greater risk may be that activity is simply off-shored ([Turner et al., 2018b](#)). Thus, there is an urgent need to consider both finance mechanisms and how costs may be reduced through a government role in reducing the risk of CCS activities.
7. We will shortly be publishing a UKERC report on the financing of residential energy efficiency, with a focus on the Energy Efficiency Scotland (EES) programme and the potential impacts of Brexit. ([Turner et al., 2018c](#))<sup>3</sup>. One key conclusion of that work is that government grants are instrumental in delivering fuel poverty alleviation goals in so much as households do not need to repay loans. However, restricted access to EU funds, regardless of whether they come from the European Investment Bank (EIB) or the European Structural and Investment Funds (ESIF), could limit the Scottish Government's ability to offer the originally planned amount of grants.
8. The second conclusion of our UKERC work focuses on the use of private loans. Loans, whether in interest-free or low interest form, are in practice the main mechanism to fund EES projects, particularly for those households not eligible to

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<sup>3</sup> The UKERC work builds on the [Turner et al., 2018c](#) policy brief.

receive grants. On this basis, the current plan is that private loans would constitute the largest source of contributions towards EES projects. However, uncertainty around Brexit and the future relationship between the UK and the EU has already begun to affect the availability of investment capital for loans. Thus, it follows that reduced availability of loan finance could undermine the achievement of the energy/climate change goals as less households are likely to opt to implement energy efficiency improvement projects.

**Question 3: How might HMT deliver a regionally balanced and 'just' transition across the UK?**

9. Giving attention to jobs, the quality of jobs, and the level and distribution of different types of households in different parts of the UK is crucial in considering a 'just transition'. The 'just' transition is not just about considering the distribution of impacts of different decarbonisation actions. Rather, it creates the societal permission from the people of the UK for the chosen approach(es) to delivering net zero ambitions. That is, people may care about and rank addressing climate change as a priority, but securing their own real incomes and purchasing power, and ability to care for their families will inevitably take priority. For this reason, addressing the need for a 'just' transition requires careful consideration and consultation. On the other hand, we know that issues around 'who pays' for decarbonisation actions (discussed above) and sustaining (and growing) high quality jobs will be crucial determinants, which motivates the economy-wide focus that drives our research and this submission.
10. We would highlight the potentially very uneven regional distribution impacts if decarbonisation of our high value industry clusters does not develop in a way that permits firms to continue to operate competitively at their current regional sites in the UK (see paragraph 6 above). On the one hand, the negative impacts of contraction of any one key industry at any one of our regional clusters would ripple out through the wider UK supply chain. On the other, if we can find ways of permitting firms to decarbonise in a cost effective way and, crucially with Government playing a role not only in managing risk but enabling the development of supporting infrastructure, affordable decarbonisation could become a key factor in attracting foreign direct investment and the growth of our regional clusters.
11. We close by making note of the importance of supporting the transition of the UK oil and gas industry. This is crucially important in terms of how the transition impacts the Scottish economy and workforce (but, of course with important tax and supply chain impacts in the wider UK). In work sponsored by the Crown Estate Scotland ([Turner et al., 2019c](#)), we focussed on the need to sustain and transition the approximately 44,000 direct and indirect Scottish jobs currently linked to oil and gas and other related industrial sectors, with the largest share of these (around 26,000) located in the on-shore support industry. During previous contractions in the oil and gas industry, the north east region of Scotland, in and around Aberdeen, has been particularly hard hit.
12. In subsequent work sponsored by Scottish Enterprise ([Turner et al., 2019d](#)), we focussed on the potential evolution of the UK oil and gas industry to develop large

scale CO<sub>2</sub> management activity (including production of low carbon fuels alongside potential carbon storage activity) that may be crucial in terms of realising a just and regionally balanced transition. It is an opportunity that can be realised through the continued transition of unabated oil and gas towards zero emission energy systems, exploiting the already strong supply chain links within the Scottish economy and extended to the rest of the UK, and, crucially, providing sustained, secure and attractive career opportunities to existing and new workforce entrants.

13. The core foundations of the industrial decarbonisation opportunity are likely to have important foundations in CCUS, with world class offshore geological sites with large CO<sub>2</sub> storage potential in the UK continental shelf and the presence of existing skills, knowledge, capacity and infrastructure to deliver CO<sub>2</sub> transport and storage services. Development of such a new industrial activity is already being explored in Norway (Størset et al., 2018). It would utilise existing onshore and offshore energy supply industry, pipeline infrastructure and associated extensive supply chain links, and provide attractive upskilling and reskilling opportunities for existing workers in the sector and appealing career prospects in a low carbon industry context for the next generation. This is crucial in delivery of ambitions for a 'just' transition at Scottish and UK levels. In short, establishing a large-scale CO<sub>2</sub> management industry would mean an alternative and new use for the capacity, infrastructure and workforce traditionally associated with Scotland's oil and gas industry. The shift in this capacity has already begun through the offshore renewables sector. Our initial estimates suggest that by 2030 anywhere between 7,000 and 45,000 UK jobs (depending on levels of demand for CCS services) could ultimately be associated with Scotland securing 40% of the carbon storage element of a European CO<sub>2</sub> management market. By 2050 this could rise to between 22,000 and 105,000 jobs, and more as the industry extends to low carbon fuel supply.

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