UNIVERSITY of STRATHCLYDE
CENTRE FOR
ENERGY POLICY

Centre for Energy Response to the Draft Heat in Buildings Strategy

The Centre for Energy Policy (CEP) was established in 2014. CEP, led by Professor Karen Turner as Centre Director, is multi-disciplinary hub that facilitates research, knowledge exchange and policy engagement on energy and climate policy issues from a wider public policy perspective. Uniquely, CEP offers a 'wider view' of energy and climate policy, going beyond technology-driven analyses to consider the wider economic, social and political context of low carbon transitions, and the decision making that supports and enables those transitions. In particular, CEP has expertise in modelling for wider economy scenario analyses to investigate how different actions and options are likely to impact across the wider economy, how and where value is generated and to which sectors and regions it accrues. CEP's research and stakeholder engagement work is enabled by a range of research council, industry and philanthropic funders, with the core body of our current activity supported by the Bellona Foundation with funding from the Children's Investment Fund Foundation.

Key Points

- There is a need to understand the wider economy impacts of heat decarbonisation options along with the distributional impacts, more generally in terms of the changing industrial landscape and workforce implications, but with particular focus on how investment cost recovery and shifting demand may impact energy bills/prices faced by both business and residential users. This is likely to be a concern in terms of how low income households may be effected and how they can be supported / protected through the transition. Once this is better understood more detailed policy actions can be identified.
- Understanding the investment needs for energy network reinforcement along with both the capital requirements and operating costs for all decarbonisation pathways will be crucial to identify the correct policy leavers needed to deliver the transition in an equitable and just way.
- More research on how the costs/price of producing/distributing/supplying electricity may evolve with a significant growth in demand - for both heat electrification and for the electrification of transport – is needed. This has important implications for both achieving fuel poverty reduction targets and how the transition impacts activity in and the competitiveness of other sectors in the economy, such as manufacturing.
- Developing domestic supply chains, sustaining/evolving capacity and jobs already present in existing ones (such as Oil and Gas), and ensuring higher/quality local content in both energy efficiency and low carbon heat sectors will be important for maximising economic benefits and offsetting the inevitable costs associated with decarbonising heat.
- Opportunities to realise net expansionary power in both existing and emerging sectors of the UK economy should be prioritised as revenues can be used to offset any additional costs to the public budget. Areas where Scotland has a comparative advantage and can export services should be identified as a priority.

Introduction

As well as recognising the need for significant investment and changing the way people live their lives, we believe that one of the key challenges for making decisions around heat decarbonisation is the need to understand what the policy, political economy and societal consequences of any decarbonisation action or 'pathway' may be. It is clear that any heat decarbonisation pathway must involve actions that are not only technically but economically, socially and politically feasible, and that any successful delivery will involve a range of wider public policy actions (not limited to financial support).

Since early 2020, through our work with the Bellona Foundation CEP has been developing a Net Zero Principles Framework[1] (See Figure 1 in appendix) that can be used by policymakers, regulators and industry to assess any decarbonisation action against key questions and highlight the importance and complexity of ensuring feasibility of actions in a political economy arena. Our proposition for a Net Zero Principles framework to support policy analysis and development recognises that any decarbonisation pathway or action will involve two interacting stages:

1) **Enabling stage:** Before any emissions reductions can begin, there is a need to invest in, install and facilitate operation of new equipment, infrastructure and/or systems capability to enable emissions reduction.
2) **Realising stage:** with invested capacity and capability in place, emissions reductions can be realised through changes in how by working with new capacity in how people live and work.

Identifying and understanding the consequences of actions across these two stages, and pulling through solutions that can deliver politically and socially acceptable outcomes, is the means by which the required policy, regulatory and financial environment can be structured and aligned in a way that enables net zero transitions – such as heat decarbonisation. Through research development and stakeholder engagement, a range of recurring and fundamental questions emerged to aid in the identification and understanding of the consequences across both enabling and realising stages in a political economy context:

1. **Who pays and who gains, how and when**?
2. To what extent can **gains be used to balance/compensate who ultimately pays**?
3. Are there opportunities for net zero pathways to **generate and sustain wider economy expansion** and maximise gains within transitioning economies?
4. To what extent does taking first **or early mover steps** in deploying particularly large scale low carbon solutions risk the **competitiveness of domestic industry**?
5. Is it better to effectively **import emissions reducing capacity** to enable faster emissions reductions, or to invest in **building 'green' supply chain capacity at home**?
6. What are the **fiscal and distributional consequences** of evolving wider economy impacts of transition pathways in different time frames?
7. How does this **impact the required timing of benefits** to justify and/or enable action by different individuals, groups and sectors across the economy and society?

In considering this initial framing, we propose that five key Net Zero Principles, which should be considered by policymakers are emerging:

[1] Turner, K. Katris, A., Race, J. (2021) The need for a Net Zero Principles Framework to support public policy at local, regional and national levels. Local Economy: The Journal of the Local Economy Policy Unit. https://doi.org/10.1177%2F0269094220984742

1. Understanding **who really pays** for any given action/pathway or combination thereof, **how and when, and what gains can be used to balance** this is fundamental.
2. Policymakers and stakeholder communities need to **find and build consensus around pathways** that allow regions and nations to sustain and grow the prosperity of populations in **an equitable way**
3. Not least in contexts where economic conditions are currently challenging, finding options and **pathways that can deliver near term economic returns** is crucial
4. **'Off-shoring' is not the answer** in regional/national or global contexts if it only shifts emissions, jobs and GDP overseas
5. N**et zero is a societal and public policy challenge more than it is a technological one.**

We believe that these principles very much align with the position set out in draft Heat and Buildings Strategy and we will be looking to engage further with the Scottish Government as the final strategy is developed.

Responses to Specific Questions

In this response we have only answered questions where we have research evidence to underpin our answers. Where possible we have drawn evidence from research undertaken to understand the wider economy and societal impacts of deploying electric vehicles and energy efficiency but where some learnings applicable to the heat transition can be drawn. CEP is broadening its research portfolio to undertake more research and analysis on heat decarbonisation and will be keen to support and engage with the Scottish Government in time.

Chapter 2 – A 2045 Pathway for Scotland's Homes and Buildings

1. To what extent do you support the pathway set out for achieving the 2045 net zero target and the interim 2030 target?

We do not have a strong view on the pathway set out. However we believe there is a need to understand the wider economy impacts of heat decarbonisation options along with the distributional impacts, more generally in terms of the changing industrial landscape and workforce implications, but with particular focus on how investment cost recovery and shifting demand may impact energy bills/prices faced by both business and residential users. This is likely to be a concern in terms of how low income households may be effected and how they can be supported / protected through the transition. Once this is better understood more detailed policy actions can be identified.

2. What are your views on any risks of unintended consequences from this pathway?

As noted later in our response, we believe more research and analysis is needed to understand how the costs/price of producing/distributing/supplying electricity may evolve with a significant growth in demand - for both heat electrification and for the electrification of transport. This has important implications for both achieving fuel poverty reduction targets and how the transition impacts activity in and the competitiveness of other sectors in the economy, such as manufacturing.

4. What are your views on any risks of unintended consequences from this pathway?

CEP does not have a particular view on the strategic technologies set out, but broadly agrees with the approach of identifying least regrets options. As explained in our response to question 40, CEP research shows that a range of wider economy benefits can be realised with the delivery of a national energy efficiency programme. Our economic modelling[2] shows that a £5 GDP boost could be realised for every £1 of public funds spent. This economic benefit, along with the ability of energy efficiency to reduce fuel poverty and provide health and wellbeing benefits makes it likely the lowest regrets option out of all identified. Further research on energy efficiency undertaken by CEP also explores how different funding options (at a UK level) can impact the varying outcomes of deploying a large scale energy efficiency programme[3].

However, while energy efficiency is likely the clearest least regrets option for reducing emissions from heating from buildings and reducing fuel poverty, as noted in our introduction, we feel that further research is needed to identify and understand what the policy, political economy and societal consequences of other decarbonisation options are.

This may be particularly true if multiple heat decarbonisation pathways are driven forward. For example if *'deploying heat pumps in certain buildings currently using mains gas'* is taken forward some key questions arise. For example, will households who switch to heat pumps still be responsible for contributing to the costs of the mains gas network or will only those who continue to use mains gas be expected to contribute to ongoing network costs. Questions also remain around the use of hybrid systems in this regard. Will users of hybrid systems, who may only use the gas network on an occasional basis be expected to pay network costs. Understanding equitable and fair transition pathways which address questions like these will be critical to the successful decarbonisation of the heat sector in Scotland.

Chapter 5 – Preparing our Energy Networks

28. In your view, is there further action that can be taken to ensure that our electricity systems are ready for heat decarbonisation? I f yes, please provide further information.

We strongly agree with the statements in the draft Heat in Buildings Strategy that:

"Electrifying a significant proportion of our heat over the course of this decade will substantially increase the amount of energy that our local electricity distribution networks need to deliver to buildings."

"We understand that the cost of this investment could be significant, especially when coupled with the impact on electricity networks of increased electrification of transport. At present, there is a great deal of uncertainty on these costs and more work is needed to

[2] CEP Policy Briefing - Potential Wider Economic Impacts of the Energy Efficient Scotland Programme available here https://strathprints.strath.ac.uk/63819/ and peer reviewed journal Figus, Gioele and Turner, Karen and McGregor, Peter and Katris, Antonios (2017) Making the case for supporting broad energy efficiency programmes : impacts on household incomes and other economic benefits. Energy Policy, 111. pp. 157-165. ISSN 0301-4215 available here: https://strathprints.strath.ac.uk/61891/

[3] CEP Policy Brief - Funding UK Residential Energy Efficiency : The Economy-wide Impacts of ECO and its Alternatives – available here https://strathprints.strath.ac.uk/71454/

reduce that uncertainty. It is also important to understand how these costs will be met, who will pay and what the impact may be on consumer bills.

"We will undertake work in 2021 – 2022 to explore the potential network investment costs of the heat transition for Scotland, to provide greater clarity on the likely range of costs, and likely impacts on consumers, to help inform further decision-making."

Research undertaken by the Centre for Energy Policy at the University of Strathclyde assessed the investment needs and wider economy implications of upgrading the electricity networks to facilitate the roll-out of electric vehicles[4]. Given similarities in the nature of the investment likely needed to upgrade the electricity networks to facilitate the wide spread uptake of heat pumps, this research can provide some useful learnings for Heat (where we are currently expanding our research portfolio). However we strongly agree that actions described under point 29 are needed to better understand the costs associated with the rollout of heat pumps – particularly around the investment required to upgrade the electricity networks will impact on electricity prices and prices in the wider economy.

Our research[5] into the wider economy impacts of the roll out of electric vehicles (including both the investment needed to upgrade the electricity networks and the wider uptake of EVs) showed that the transition could bring some long term wider economy benefits (positive impacts on GDP, labour productivity and employment) but that attention should be paid to the impacts on the price of electricity. A summary of the key learnings are noted in the text box below.

However, while some learnings can be drawn from the comparison with the electric vehicle roll out, a number of the more positive elements of the results presented above are currently less certain for the electrification of heat. The positive wider economic outcomes described above are largely associated with the growing nature of the electricity sector which has a strong domestic content, when compared to petrol and diesel supply, and due to the increased efficiency of electric cars which reduces operating costs for users. This reduction in 'operating cost' associated with electric cars compared with petrol and diesel facilitates a boost to consumer spending in the wider economy which brings economic benefits. The wider economy impacts of electrifying heat will also depend on the operating costs of heat pumps, and whether it can lead to a reduction in costs for households. If the opposite is true and the operating costs of heat pumps is higher than what they are replacing then the impacts on the wider economy will be less positive. However the broadly positive economic impacts of a growing electricity sector reported in CEPs EV research could also be bolstered by the growth in demand from heat electrification on top of transport.

As noted in the draft Heat in Buildings Strategy further research is needed to understand the investment requirements for network reinforcement, and how this builds on the investment need for electric vehicle reinforcement noted above, and how this investment affects the price of electricity and prices in the wider economy. To understand the full economic picture (e.g. effect on GDP, public budget, labour productivity etc.) a better understanding of the capital requirements for new heating systems, the supply chain implications, and operating costs is also needed. This would allow for an analysis of the distributional impacts of heat

[4] Can the Electrification of Private Transport Lead to Economic Prosperity? https://strathprints.strath.ac.uk/73568/

[5] Christian F. Calvillo, Karen Turner,
Analysing the impacts of a large-scale EV rollout in the UK – How can we better inform environmental and climate policy? Energy Strategy Reviews, Volume 30, 2020, 100497, ISSN 2211-467X, https://doi.org/10.1016/j.esr.2020.100497.

electrification to understand how different household income groups would be affected. When this is known, actions can be identified to protect those in fuel poverty from any increase in energy costs which may exacerbate their position.

As highlighted in our research above, the increasing demand for electricity, both for transportation and heat, could drive an increase in electricity prices. This could not only impact on the running costs of both heat pumps and direct electric heating systems, but has potential to impact other sectors across the economy such as manufacturing.

Therefore more research on how the costs/price of producing/distributing/supplying electricity may evolve with a significant growth in demand - for both heat electrification and for the electrification of transport – is needed. This has important implications for both achieving fuel poverty reduction targets and how the transition impacts activity in and the competitiveness of other sectors in the economy, such as manufacturing. More research is needed to how policy levers could be used to mitigate this.

Key learnings from CEP research on the electrification of transport show that:

- An almost full electrification of the private vehicle fleet will undoubtedly increase the demand, and therefore the capacity needed, on the electricity transmission and distribution networks. Depending on how fast consumers adopt smart charging, we estimates that the necessary electricity network reinforcement may cost between £9.8Bn (fast uptake) and £16.9Bn (slow uptake), with significant variation in how spending needs to be spread among the years until 2050. This investment is funded through consumer bills and repaid over a 45-year period.

- All three scenarios we model where the uptake of smart (off peak) charging is varied, trigger an immediate positive impact on UK GDP. In the UK context, the associated shift in fuelling away from using import-intensive petrol and diesel towards the output of the electricity sector (with its relatively strong domestic supply chain content) is the key component that results in initial positive gains across the wider economy. As the EV rollout gains pace, the boost, triggered and driven by more demand for UK electricity and greater consumer/household spending (ultimately rising to 0.18% higher than it would otherwise be) across a wide range of UK sectors, is likely to be sufficient for many UK industries to enjoy sustained expansion - outside of those supplying conventional vehicles and fuel.

- In the long-term this leads to net positive effects on employment (+0.12% - up to 30,000 additional full-time equivalent jobs) and earnings (+0.22%) which will ultimately be the key source of a sustained wider economy expansion. The sustained net effect on GDP, is a long-term stabilised increase of +0.16% - after all network investment repayments have been made post 2095.

- The sustained economic expansion ultimately involved cost and price pressures in all sectors (including the electricity industry) that will result not only in higher electricity bills for all users, but a general increase in consumer prices

- Our scenario results for the scenario with the slowest uptake of smart charging suggest a peak 0.35% increase in the price of electricity by 2050. This is a result of both increased cost and price pressures across the economy, which, being driven by the growth in the electricity sector, will impact electricity prices in particular and the need to repay the costs of network reinforcement. The latter is a source of pressure that dissipates as investment costs are recovered. However, with a lasting labour supply constraint in the UK economy, sustained impacts on electricity and other prices can be anticipated.

- The main energy policy implication in this regard is that greater pressure on electricity prices could act to widen real income inequalities, which could become a challenge for policymakers in considering the regulation, planning and timing of other energy investments.

30. In your view, what changes are needed to ensure that those least able to pay, including those in fuel poverty, are not unfairly impacted by the transition in our electricity and gas networks?

As noted in our response to question 28, further research which identifies how both the wider economy and different household income groups will be affected by the need to reinforce the electricity networks for heat decarbonisation is needed. Once this is better understood the appropriate policy levers can be identified to ensure those in fuel poverty are not unfairly impacted. As noted in our response to question 4, it is also important to understand the implications of certain households switching to heat pumps. Could this result in the smaller number of households still connected to the mains gas network (some of which will be fuel poor) having to make a larger contribution for the maintenance and operation of the gas network?

Chapter 6 – Kick- starting the investment in the transition

38. Do you agree with the strategic funding priorities set out above?

We support the strategic priorities set out in the draft Strategy. However we believe there is a need to consider a broader strategic point. We believe that strategic actions of all sorts (including the approach to required investment and industry evolution/restructuring of industry landscape) should be consistent with the Just Transition principles adopted by the Scottish Government. There is a broader need to ensure we transition through and to a low and ultimately net zero carbon economy that delivers prosperity to all.

As discussed in a recently published CEP report 'Laying the Foundations to a Net Zero Society- Principles and Infrastructure for a Climate Resilient and Economically Sustainable Recovery'[6] net zero actions such as making buildings more energy efficient can help with the twin aims of promoting economic growth whilst reducing emissions. However, for broader elements of heat decarbonisation, such as the conversion of the gas network to hydrogen or wide spread roll out of heat pumps, more analysis is needed to identify sectors and demographics that may be negatively affected and how policy levers can be used to support those identified.

We agree that prioritising low regrets options is a sensible approach and moving early to develop a competitive advantage in areas where expertise and services could be exported could also be beneficial and help to offset some of the costs associated with the transition. Supporting those least able to pay is also crucial for delivering a Just Transition. However this may not necessarily mean direct support such as grant payments, it also can include ensuring options that bring benefits to wider society, such as job opportunities and growth across a range of different sectors is prioritised and planned for.

40. What are the opportunities and challenges we face in maximising our £1.6 billion investment?

Research undertaken by CEP examined how a national Scottish Energy Efficiency Programme could bring a range of wider net economic benefits[7] and explored how any

[6] Laying the Foundations for a Net Zero Society : Principles and Infrastructure for a Climate Resilient and Economically Sustainable Recovery https://strathprints.strath.ac.uk/72953/

[7] Potential Wider Economic Impacts of the Energy Efficient Scotland Programme https://strathprints.strath.ac.uk/63819/ and peer reviewed paper available: Figus, Gioele and Turner, Karen and McGregor, Peter and Katris, Antonios (2017) Making the case for supporting broad energy efficiency

benefits could help to offset associated costs/investment needs. CEP considered the impacts of £8billion in spending over 20 years on improving residential energy efficiency in Scotland. 20% of this is Scottish Government grants (all directed to low income households), a further 15% via the Energy Company Obligation (ECO) and 65% in household contributions (via interest free loans). Data compiled by the Scottish Government and the Energy Saving Trust suggest that this will lead to an average 9.6% reduction in energy required to run Scottish households by the end of the 20 year programme. And in the 20% of households with the lowest incomes, this rises to 13.2%.

The key findings were that:

Cumulative GDP impact: £7.8bn in real GDP over the next 30 years

- We estimate that the combination of enabling energy efficiency gains, via the above spending, and the knock-on impacts of realising this gain on household spending power, could potentially deliver a cumulative boost of £7.8billion to Scottish GDP over the next 30 years (a timeframe that allows time for all loans on later spending to be paid off). This gain could be greater with more spending and/ or realisation of efficiency gains, and vice versa.

Sustained rate of GDP expansion: 0.2% additional GDP over the long term

- The GDP boost also equates to the sustained delivery of an additional 0.2% in Scottish GDP into the long term. This is estimated to be realised by the fifth year of the Energy Efficient Scotland programme, although it does fall back slightly for up to several years after the completion of the 20-year programme (and households are still paying off loans). This level of expansion in Scottish GDP (relative to what it would have been in the absence of the Energy Efficient Scotland programme) would be then largely sustained over the long term as the impacts of realising energy efficiency gains continue.

Real public spending multiplier: £5 GDP boost per £1 of public funds spent

- If the estimated direct Government spending (grants) is taken as the key enabler of Energy Efficient Scotland activity, this suggests a 'multiplier' return of about £5 in GDP per £1 of public spending

Jobs: 6,000 sustained jobs could be created

- The GDP boost is estimated to be associated with around 6,000 sustained (full-time equivalent) jobs, realised in the fourth year of the programme and largely sustained into the long term, again with some contraction in the years following the end of the 20-year programme. During the programme itself, additional jobs (along with further peaks in GDP) would be associated with retrofitting activity etc., which we estimate would peak at just under 9,000 additional jobs in the sixteenth year

The importance of realising energy efficiency gains to free up household spending

- Over the long term, the sustained boost to jobs and GDP is driven by more energy efficient Scottish households having more spending power, rather than the (time limited) projects that enable this to happen. Overall, just under 64% of the estimated cumulative GDP impact of £7.8billion is associated with the impacts of Scottish households actually becoming more energy efficient and, thus, having more disposable real income freed up to spend on other things.

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programmes : impacts on household incomes and other economic benefits. Energy Policy, 111. pp. 157-165. ISSN 0301-4215 available here: https://strathprints.strath.ac.uk/61891/

While the economic benefits of the long term programmes are clear, there are obvious challenges around the extent of household contributions needed to realise broader wider economy benefits. The £1.6bn set out in the draft Heat in Buildings Strategy will need to include significant resource to incentivise households to uptake interest free loans needed to upgrade properties and realise the required energy efficiency gains. It also must be recognised that the requirement to fund the procurement and installation of new low carbon heating systems (in low income households), above energy efficiency requirements, is likely to present a significant costs to the public budget – with installation costs of up to £10,000 recognised in the draft strategy. The Government should asses how growth and revenue streams from other sectors can be used to offset the costs associated with supporting low income households to transition to low carbon heat sources.

41. What are your views on the role of government funding over the next five years? For example, should it be focused towards significant increases in the volume of renewable heat and energy efficiency measures installed or more targeted at specific priority groups or technologies?

As noted in our response to question 40, a national energy efficiency programme could provide a range of grants targeted at low income/fuel poor households, along with other measures such as interest free loans, for those able to pay. This mix of measures and incentives can be used to support a range of households to upgrade their homes. Recent research[8] undertaken by CEP in collaboration with BEIS explored how different funding mechanisms can lead to different outcomes that may allow varying policy objectives to be achieved.

For example, targeting energy efficiency measures at low income households could reduce fuel poverty rates by reducing the energy needs of those homes. However, installing measures in higher income households with higher initial energy use could lead to greater benefits to the economy[9] as their ability to spend in other sectors as a result of energy savings could be greater than lower income households. Using this energy efficiency case as an example, it is important that the implications of prioritising different technologies and demographics for Government support are carefully considered. It is also clear that supporting different sectors and different technologies will deliver on different policy ambitions.

[8] Funding UK Residential Energy Efficiency : The Economy-wide Impacts of ECO and its Alternatives https://strathprints.strath.ac.uk/71454/

[9] Funding UK Residential Energy Efficiency : The Economy-wide Impacts of ECO and its Alternatives https://strathprints.strath.ac.uk/71454/

Chapter 9 – The Economic Opportunity

52. What are your views on the plans set out to maximise the economic benefits to Scotland from the heat transition.

We broadly support the plans set out in the draft Strategy, particularly to support local supply chains and to identify areas where Scotland is well placed to develop a comparative advantage in some areas. However we believe that a broader understanding of the economy wide impacts of the heat transition is needed where the net impact of any transition pathway must be understood. For example the economic opportunity must consider how current jobs, supply chains and sectors that provide economic contribution can be sustained and evolved to contribute to a decarbonised heat sector. The end goal with net zero more broadly and of which heat decarbonisation is a key challenge will be not to harm the economy/erode GDP, to sustain/evolve existing jobs and income generation, and deliver small net gains where possible.

Although more research is needed, of all Net Zero actions, the decarbonisation of heat may be the most challenging from an economic perspective given the relatively low cost of natural gas and that associated sectors such as gas distribution provide a significant economic contribution to the wider economy and support relatively high wage jobs in supply chains etc. Given the scale of the transition set out in the draft strategy, there is a need to substantially and systematically develop the evidence base on the likely impacts on wider economy trajectories (GDP/employment etc.), on distributional impacts and how the transition can align with the Just Transition principles adopted by the Scottish Government.

We also believe that the CEP 5 Net Zero Principles should be considered when considering how the Heat in Buildings Strategy set out by the Scottish Government can be delivered.

These are:

1. Understanding **who really pays** for any given action/pathway or combination thereof, **how and when, and what gains can be used to balance** this is fundamental.
2. Policymakers and stakeholder communities need to **find and build consensus around pathways** that allow regions and nations to sustain and grow the prosperity of populations in **an equitable way**
3. Not least in contexts where economic conditions are currently challenging, finding options and **pathways that can deliver near term economic returns** is crucial
4. **‘Off-shoring’ is not the answer** in regional/national or global contexts if it only shifts emissions, jobs and GDP overseas
5. N**et zero is a societal and public policy challenge more than it is a technological one.**

Appendix Figure 1: A provisional proposition for a 'Net Zero Principles Framework' for analyses of individual/combinations of net zero actions

ENABLING STAGE (ES) *Action that does not directly affect targeted emissions but which is necessary to enable emissions reductions*	INTERFACE	REALISING STAGE (RS) *Enabled action that reduces targeted emissions*
		Sustained implications for how businesses operate/how people live?
Transitory or permanent activity? How does this impact expectations and responses?	ES activity necessary to trigger RS	Does the action involve economic efficiency gains/losses? How and to whom do gains/losses accrue?
What is the finance model and who ultimately pays? Business models and regulatory framework? User pays - user bills, industry output prices? Socialising - impacts on public budgets, different forms of taxation?	RS activity may begin quickly alongside ES or require ES completion	Crowding out/supply chain and market impacts? Need for compensation/contribution? Sustained, transitory and/or evolving impacts?
Business/consumer/citizen responses to finance burdens?	Confidence/certainty sustained RS return	Shift in spending/sourcing patterns Higher domestic content or greater reliance on imports?
Transitory investment as traditional 'demand shock'? Crowding out? Can investment requirements be met locally, regionally or nationally?	may necessary to secure ES participation	Direct and indirect impacts on national and global emissions? Who gains/loses overall (i.e. both directly and indirectly)?
Can ES activity deliver near term/immediate net income gains? Other?		**Can RS activity deliver sustained net income gains?** Other?