

ERP Summary Paper: An Economic Value Assessment of Low Carbon Pathways (EVAP)

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This paper aims to summarise the ways in which economic growth and job creation are currently assessed within a selection of UK-focused low carbon pathway and scenario works. The full project paper considers a non-comprehensive selection of models and approaches that are linked to five of the UK's major pathway and scenario works and assesses them in regard to their use of socio-economic input parameters. The paper characterises these models and approaches, reviews the current state of play and puts forward recommendations for future analysis.

1. Key Insights

- The UK is renowned for its modelling expertise, which contributes to high quality work across Government, Industry and Academia - many of these models are used to inform energy policy via low carbon pathway and scenario works. ERP's paper suggests that assessments of economic growth and job creation have not been carried out in great depth and analysis in this area could be improved, although it is accepted that these effects are complex to measure and define.
- Modelling types and approaches currently (and importantly) tend to focus on 1) cost-optimisation and 2) achieving carbon targets. However, in addition to a lack of analysis relating to economic impact, there is also a lack of clarity regarding input assumptions used, which can increase the risk of misinforming policy.
- Many existing energy-system modelling works are not designed to make these kinds of assessments (it is not within their remit) and incorporating this type of analysis within the models reviewed is not seen as feasible. Impacts on a regional level within the UK (Scotland, England, Wales etc.) are rarely assessed.
- The type and limited number of macro-economic 'top-down'¹ energy models being utilised currently constrains the range and reliability of assessments informing policy. Although these models exist (e.g. the Cambridge Econometrics' MDM-E3), many are not set up to assess the economic value of low carbon pathways and the range of economic and socio-economic impacts of interest to policy-makers.

¹ Top-down and bottom-up models are defined by the IPCC and these definitions are used within this paper: "Top-down and bottom-up models are the two basic approaches to examine the linkages between the economy and specific GHG emitting sectors such as the energy system. Top-down models evaluate the system from aggregate economic variables, whereas bottom-up models consider technological options or project-specific climate change mitigation policies. IPCC SAR on economic & social dimensions (IPCC, 1996a, Chapter 8) includes an extensive discussion on the differences between top-down and bottom-up models. It concludes that the differences between their results are rooted in a complex interplay among the differences in purpose, model structure and input assumptions." (IPCC, 1996a, Section 8.4.3). www.ipcc.ch/ipccreports/tar/wg3/index.php?idp=310

- There is a level of uncertainty regarding current and future modelling capabilities (models are designed for a specific purpose and are not always adapted) and a range of opinions as to whether these assessments should be included within pathway and scenario works.
- Where economic impacts such as effects on jobs, supply chains and local GDP *are* considered, they are often discussed within texts in a general and qualitative fashion². Works that previously carried out these assessments have adopted other, less detailed approaches, or have reduced this type of analysis substantially³. This is largely to avoid introducing further uncertainty amongst input assumptions or because research interests lie elsewhere.
- It *is* possible to combine model types to enable economic and socio-economic analysis, as long as the aims are well defined and modelling limitations are made clear. More could be done to integrate modelling of low carbon pathways with whole economy or ‘top down’ models.
- Examining the flows of economic benefits inside and outside of the UK is complex to assess. However ongoing analyses to understand this and provide better estimations of the UK’s ability to capture value from supply chains would be beneficial.

2. Background

Existing works on low carbon pathways and policies have focused on ‘the energy trilemma’: cost of energy, security of supply and carbon emissions, often with a significant emphasis on cost effectiveness. In particular, importance has been placed on achieving the lowest costs in the short-term, with decreasing costs in the long-term.

An area that has been relatively neglected within the development of pathways and scenarios (and related models) is the *value* and *impact* of pathways on economic growth (measured in GDP/GVA) and analysis of other socio-economic effects, including at regional levels. Reasons for this relate to current modelling interests and capabilities, and a lack of existing ‘top-down’ or ‘spatial’ models utilised within the UK.

It is well known and accepted that economic and socio-economic impacts can be intangible and complex to measure and define, but there are some existing UK models that can and do assess them.

ERP’s paper addresses the issue of how the UK currently considers and assesses economic impacts and benefits within five of the UK’s major pathway and scenario works. It additionally considers modelling capabilities (now and in future) and highlights other relevant models or works that can assist with analysis in this area. Works assessed within the paper are: 1) CCC’s 4th Carbon Budget Review, 2) DECC’s 2050 Pathways/Calculator & Analysis (with some extra consideration of the Dynamic Dispatch (DDM) model), 3) ETI’s ESME model, 4) National Grid’s Future Energy Scenarios (RESOM model) and 5) the MARKAL ELASTIC DEMAND model used to inform two of UKERC’s Energy 2050 scenario works. The work additionally considers the MARKAL-MACRO and Cambridge Econometrics’ MDM-E3 models.

The paper concludes by making recommendations for how further analysis of economic and socio-economic impacts can be carried out - by utilising appropriate modelling capabilities (existing and new), to help inform policy from both a top-down and bottom-up perspective of the energy system.

² There are valuable opportunities for British businesses to develop and manufacture these products [technologies to help decarbonize], for both domestic and international consumption... Although there are opportunities in the transition, there would also be costs on business, and it is not clear to what extent low carbon jobs will be additional to existing jobs. (DECC’s 2050 Pathways Analysis, July 2010 – page 12: Understanding the role of the economy in the pathways).

³ This came to light during ERP interviews with modeling teams who previously carried out economic analysis within their works, but have reduced this over time to avoid additional uncertainties regarding input assumptions.

3. Recommendations

Main recommendations include:

- Further investigation to consider how models can be used for these assessments is required. It is noted that some 'E3' simulation-type models can include a disaggregated 'bottom-up' approach to enable assessments of the energy system from both perspectives. Utilisation of these models would help test or validate the outputs of the few existing (UK) models that provide socio-economic assessments, although it is noted that these can have weaknesses too.
- The integration of existing model types should be considered, to enable this kind of analysis and inform policy at a more strategic level. This would ensure a more multiple-perspective approach in regards to modelling of the energy system and help to avoid 'group-think'.
- Clear communication and transparency regarding the design, premise and limitations of modelling works should be encouraged to avoid the risks of misinforming policy, over-interpretation or 'cherry-picking'.
- Continued and more detailed work to assess the impacts and benefits of specific technologies for GDP, job creation and investment opportunities is encouraged, including at regional levels. This should involve a deeper analysis of the UK's potential to capture value from supply chains, plus assessments of international flows and competitiveness of the UK as a 'region' within a wider EU/global framework.
- Analysis on economic growth and job creation should be included as part of, or alongside pathway and scenario works wherever possible. This may involve an additional element of secondary analysis.
- Greater funding support is required for the development of these model types - to improve the quality of outputs and understanding of their potential.

4. Next steps

- **Review existing UK modelling capabilities for carrying out robust analysis relating to economic growth and job creation from low carbon pathways.** This should include an assessment of potential modelling adaptation or integration opportunities and should be **led by an expert body with capability to look across the whole system**, such as the **Energy Systems Catapult** or the **WholeSEM Consortium**, with accountability to government.
- Those carrying out modelling, pathway and scenario works should **ensure greater transparency** regarding input assumptions to avoid misinforming policy. Policy makers must be aware of the limitations of individual models.
- Pathway and scenario models should ideally be **'housed' within independent or impartial organisations** to help enable transparency.
- Pathways and Scenario teams should, wherever possible, **include assessments of economic growth and job creation** as part of modelling works, even in the form of supplementary or secondary analysis.
- **Better communication and a wider use of existing government guidelines** for undertaking analysis such as HMT's 'Green', 'Magenta' and 'Aqua' Books (the latter relating to quality assurance) to ensure a more consistent approach.
- **Government and The Research Councils** should provide **greater funding to enable this type of analysis** and additionally for the creation of new models / teams (where required).

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