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Transition pathways for a UK low carbon energy system: exploring roles of actors, governance and branching points

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Achieving long-term targets for carbon emissions reductions, such as the UK's legally-binding target of reducing its carbon emissions by 80% by 2050, will require a transition in systems for meeting and shaping energy service demands. This will involve radical changes to low-carbon supply technologies and improvements in end-use efficiency through technological and behavioural changes. This paper describes research that develops and analyses a set of transition pathways to a highly electric, low carbon UK energy system, which examine the roles of different actors and their interactions across niches, regime and landscape levels. The pathways use an 'action space' approach to explore the dynamic interactions between choices made by actors, which are influenced by the competing governance 'framings' or 'logics' that different actors pursue.

Three core pathways explore alternative futures dominated by market, government and civil society logics respectively. For each core pathway, a transition narrative outlines the main co-evolutionary changes and key multi-level interactions under that pathway's dominant logic. An initial quantification of the electricity demand and supply technology mix implications has been used to analyse the technological feasibility and social acceptability of the pathways, and to undertake a sustainability appraisal, including life cycle carbon emissions and other environmental impacts, using a whole systems approach. A second iteration of the core pathways and an analysis of key 'branching points' is now underway, drawing on the results of these analyses, historical cases studies of past energy transition processes, and continuing interactions with stakeholders from energy companies, policy-makers and NGOs.

The branching point analysis is being used in two ways. Firstly, we identify a limited set of key branching points across all three pathways, which are analysed to inform understanding of the sensitivity and the resilience of the pathways. Secondly, branching points specific to each pathway are explored, to inform understanding of the plausibility and internal consistency of the pathways. The branching points are defined as points at which choices made by actors, in response to internal or external stresses or triggers, determine whether the pathway is followed or not. Branching point triggers include: key technologies proving to be technically or economically infeasible; the governance framework failing to provide sufficient incentives for large investments needed; and lack of public acceptability of key technologies. This analysis will inform actions needed by stakeholders to realise feasible pathways to a sustainable, low-carbon UK energy system, and the mutual understandings of the roles of different stakeholders.