Analysing controversies in energy policy: Assessing the evidence for rebound effects and global oil depletion

Submitted by Steve Sorrell to the University of Exeter as a thesis for the degree of Doctor of Philosophy by publication in Human Geography

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I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature: 

Abstract

This thesis is submitted as a PhD by Publication. Part A provides an overview of the thesis and summarises its context, research questions, methodological approach and key findings. Part B is a collection of nine, first-named academic papers.

The thesis addresses two highly complex and controversial questions within energy policy, namely the nature and magnitude of 'rebound effects' from energy efficiency improvements and the extent and rate of depletion of global oil resources. Both of these questions are critically important to the development of a sustainable energy system and both are the subject of long-standing and highly polarised disputes. The thesis adapts, develops and applies a common methodology for reviewing the evidence on these questions, supplements this with original primary research and syntheses the results in a way that improves understanding and provides new insights.

The thesis includes four papers examining different aspects of rebound effects and four examining different aspects of global oil depletion. Given the complexity of the chosen topics, the papers cover a wide range of questions, issues and approaches. Collectively the papers: clarify relevant definitional and conceptual issues; evaluate competing methodological and analytical techniques; appraise the methodological quality of empirical studies; identify levels of uncertainty and potential sources of bias; develop simple mathematical models; conduct statistical analyses of primary data; compare and evaluate the results of modelling studies; and synthesise results from multiple research areas to provide novel insights into poorly understood phenomena. A ninth paper evaluates the strengths and limitations of systematic review techniques when applied to complex, policy-relevant questions such as these.

The thesis draws two main conclusions. First, rebound effects are frequently large and can substantially reduce the energy and carbon savings achieved from improved energy efficiency. Second, there is a significant risk that the global production of conventional oil will enter sustained decline before 2020. These conclusions run counter to conventional wisdom and have significant implications for public policy. The thesis also shows how the methodology of systematic reviews can be adapted and modified to make a valuable contribution to energy and climate policy research.

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