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Subject category: Energy transition
Title: Scenarios co-led by policymakers and academics envision demand reductions beyond typical policies

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Standfirst
Energy policy in the UK is technology- and supply-side focused, with a strong reluctance to discuss changes in how and why we use energy in our everyday lives, preferring instead to stick to simple improvements in overall efficiency. Yet a process where policymakers work with academics to consider different routes forward can offer options that are politically feasible, have 45% less energy demand by 2050, and cost half of what supply-focused approaches do.

The policy problem
Decarbonising national energy systems is key to curbing climate change and its impacts. Despite evidence that 50% reductions in demand by 2050 are achievable in the UK, national energy policy remains narrowly and overwhelmingly supply-side focused. Policy discourse, targets, and financial support advance renewable generation, grid infrastructure, new technologies, and overall efficiency improvement, but actively refrain from addressing the final energy demands that drive energy use. Hence, a persistent gap exists between academic research demonstrating the benefits of demand reduction, and actual policy implementation, with national energy strategies saying little about the broader structural and societal changes that could deliver this reduction. Without addressing this imbalance, meeting net-zero will likely mean higher costs, greater technological risks, and increased dependence on unproven carbon removals. To bridge this gap, policymakers need credible, politically feasible pathways that focus on demand while aligning with their governance realities and policy priorities.

The findings

We find that policymaker-led energy scenarios achieve 18%–45% reductions in final energy demand by 2050, while remaining politically credible. By co-designing the scenario framework, we successfully bridge the academic-policy gap, developing narratives that reflect policymaker priorities – focusing on economic growth and institutional trust – while also challenging conventional supply-focused thinking. We show that higher-demand futures, typically technology- and growth-focused, can cost 20%–100% more, and require up to 164 $MtCO_2$ combined carbon removal and mitigation. While carbon removals feature in all scenarios, lower end-use demands can reduce these volumes by 72%. Our study is UK-focused, but the context and policymaker role are transferable to economies with similar research, policy and governance structures – giving the results broader relevance. Our findings do not seek to determine scenario likelihood: we simply demonstrate the feasibility and benefits of demand-focused approaches developed through a collaborative research process.

The study

To develop four UK net-zero futures, our research replaced traditional academic-led scenario development with a policymaker-led co-creation process (Fig.1). Together with policymakers, we identified and prioritised the most important and uncertain drivers of greenhouse gas emissions through to the middle of the century. We collaboratively developed these drivers into two key uncertainty axes (social cohesion/institutional trust and economic growth/technological progress) which formed the basis for four distinct 2050 scenarios. We then modelled each scenario using established sectoral and energy system tools covering transport, buildings, materials, nutrition, and whole energy system analysis to quantify energy demands, costs, and carbon removals, among other variables. Our approach was uniquely suited to bridging the academic-policy gap because it embedded policymaker knowledge and priorities directly into scenario creation rather than presenting academic scenarios to policymakers afterwards. We also conducted public dialogue with 30 UK residents to test scenario plausibility and societal acceptance.

Messages for Policy

- Recognise that policies shape and lock-in our energy needs through the governance, institutional, and infrastructural systems.
- Co-create politically salient, demand focused, pathways and narratives, working across policy and academia to capitalise on the significant energy saving opportunities these futures represent.
- Expand the realm of energy policy, going beyond supply and energy efficiency to also include structural and societal changes.
- Recognise that high-growth futures lead to larger, costlier systems, requiring significantly higher volumes of unproven carbon removals, with significant delivery risks for net-zero targets.
- Plan energy infrastructure flexibly to avoid lock-in, as different energy futures can imply vastly different energy systems with significant variations in infrastructure requirements.

Source research

Maria Sharmina, Oliver Broad, John Barrett, Christian Brand, Alice Garvey, Harry Kennard, Jonathan Norman, James Price, Steve Pye, Jack Snape, Emily White. Policymaker-led

scenarios and public dialogue facilitate energy demand analysis for net-zero futures. *Nature Energy*.

Further Reading

1. Barrett, J., Pye, S., Betts-Davies, S. et al. (2022) Energy demand reduction options for meeting national zero-emission targets in the United Kingdom. *Nature Energy* 7, 726–735. https://doi.org/10.1038/s41560-022-01057-y
This article demonstrates that energy demand reductions of up to 50% are achievable by 2050 through societal and structural changes while maintaining quality of life.

2. Barrett, J., Betts-Davies, S., Garvey, A., & Marsden, G. (2023), *The Missed Opportunity: Ignoring the Evidence on Energy Demand Reduction*, Centre for Research into Energy Demand Solutions. Available at: https://www.creds.ac.uk/publications/the-missed-opportunity-ignoring-the-evidence-on-energy-demand-reduction/
This report documents the systematic overlooking of energy demand reduction evidence in UK policy despite clear benefits for cost reduction and climate targets.

3. Bermingham, R., Snape, J., Wells, T., Ballard, H., Blackbourn, H., Grassmann, N., Nicol, C., Sharmina, M., Taylor, M., & White, E. (2023). *Net zero society: scenarios and pathways: How could societal changes affect the path to net zero?* Government Office for Science. Available at: https://www.gov.uk/government/publications/net-zero-society-scenarios-and-pathways--2
This government report presents the full technical details and scenario narratives from the policymaker-led co-creation process described in this Policy Brief.

4. Larkin, A., Kuriakose, J., Sharmina, M., & Anderson, K. (2018). What if negative emission technologies fail at scale? Implications of the Paris Agreement for big emitting nations. *Climate Policy* 18(6), 690-714. https://doi.org/10.1080/14693062.2017.1346498
This article examines the delivery and equity risks of over-relying on unproven carbon removal technologies to meet national climate commitments.

5. Grubler, A., Wilson, C., Bento, N. et al. (2018) A low energy demand scenario for meeting the 1.5 °C target and sustainable development goals without negative emission technologies. *Nature Energy* 3, 515–527 (2018). https://doi.org/10.1038/s41560-018-0172-6
This global study demonstrates that a 40% reduction in energy demand by 2050 is achievable while meeting climate targets and development goals without relying on negative emission technologies, showing the potential of demand-side approaches at scale.

Figure

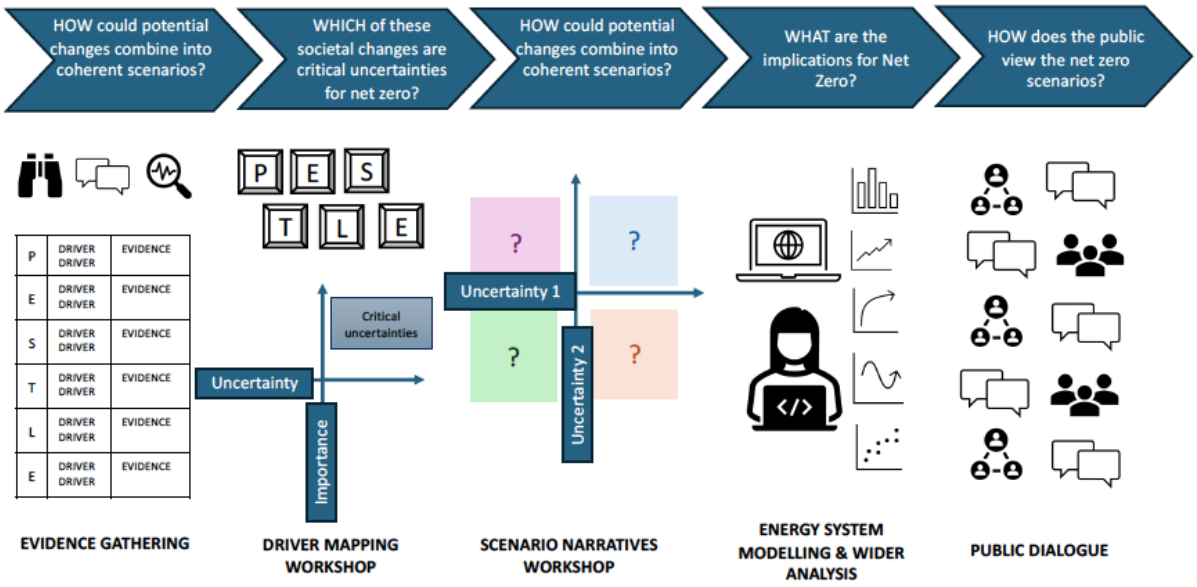

Figure 1. The five-step policymaker-led approach taken in this paper for co-developing and modelling net-zero futures for the UK society.

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Competing interests

The authors declare no competing interests.