

## Positive low energy futures

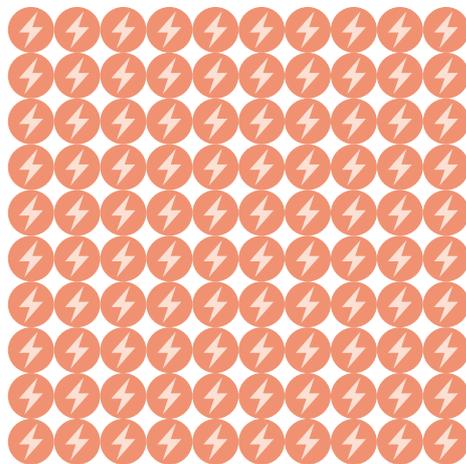
### Summary

Reducing the UK's overall energy demand provides a necessary and major contribution to net-zero emissions by 2050 as part of a comprehensive climate plan, with many associated benefits that would improve quality of life for all.

Cutting energy use could:

- deliver around half of UK emissions' reduction by 2050;
- enhance quality of life, with significant co-benefits that align with other policy objectives (health, biodiversity, affordable warmth);
- reduce the risks and costs associated with relying on untested, undeveloped technical solutions in energy supply and engineered carbon dioxide removal (CDR, sometimes called geo-engineering).
- A low energy demand strategy could be at the heart of a fair, affordable and healthy route to net-zero.

New research from CREDS (Centre for Research into Energy Demand Solutions) suggests that it will be difficult and expensive to meet the UK's net-zero target without measures to reduce demand for energy.



Energy demand 2020



Energy demand 2050



## Why energy demand?

The size of total energy demand is determined by the amount of goods (clothes, food) and services (heat, travel) we consume and the efficiency with which we use energy to meet that consumption. The energy for goods and services in future must come from zero-carbon sources. But the transition away from fossil fuels will not happen quickly enough if energy demand continues at the same level, or increases.

Improving efficiency (using less energy to create the same service) and reducing the consumption of energy-using services and products will cut overall energy demand. This smaller total energy demand makes the goal of net-zero easier and cheaper to achieve.

Energy demand reduction is a proven, but under-explored, resource for meeting net-zero objectives. New modelling and analysis, never before done so comprehensively at a national level, offers novel insights for UK policymakers.

A low energy demand strategy would make net-zero achievable with fewer risks, lower costs and multiple social benefits: more jobs, cleaner air, healthier citizens.

## The challenge of net-zero

The UK has ambitious net-zero objectives but has not agreed either the pathways or the policy framework to achieve them.

CREDS' analysis of the current suite of policies is that it cannot deliver net-zero: it is moving too slowly to cut emissions, and with a high reliance on engineered carbon dioxide removal (CDR) that is expensive, with uncertain timelines and untested technologies.

## How could reducing energy demand cut greenhouse gas emissions?

Our positive low energy futures show how the transition to net-zero could look if there was significantly reduced demand for energy throughout the UK economy. Such a comprehensive analysis of the potential for lower energy service demands and higher energy efficiency has never been done at the national level, and offers a new way of thinking about the net-zero challenge.

Five activities were modelled: food and agriculture, transport, residential buildings, non-domestic buildings and industry/products. The model incorporated social changes that would reduce demand for energy (e.g. fewer miles travelled), as well as energy efficiency strategies (e.g. better insulated homes).

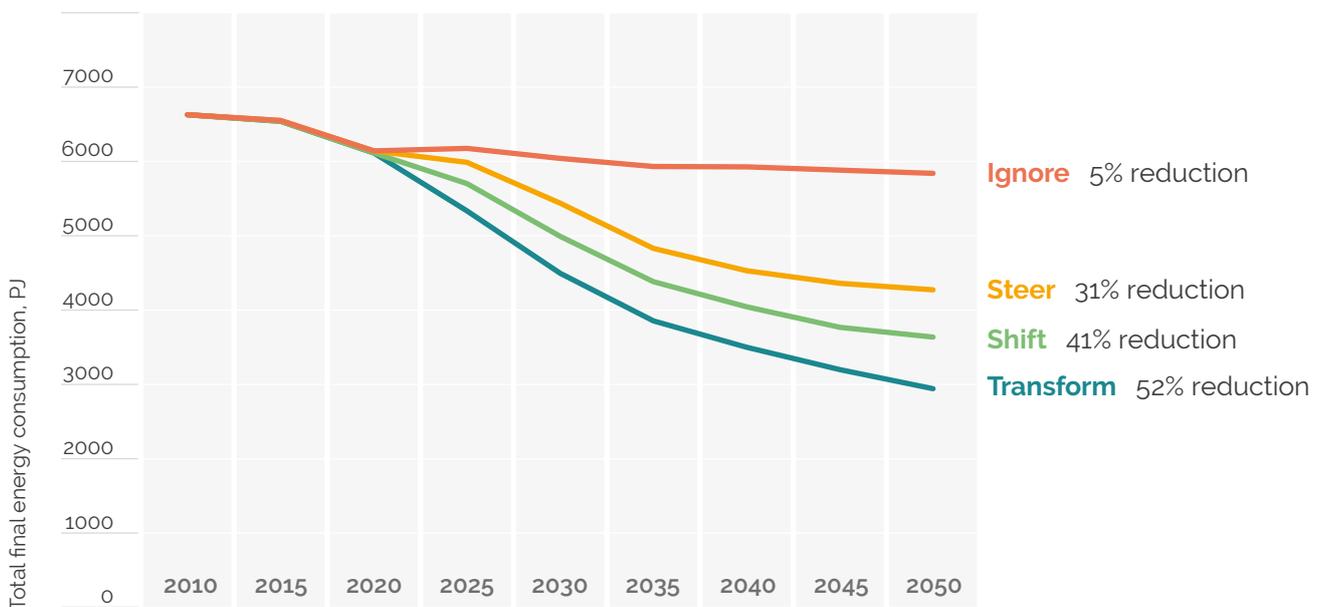
Researchers devised four scenarios – plausible futures based on likely social and technological changes. These are not predictions of the future, but they demonstrate what can be achieved with these particular packages of policy, social trends and technological developments.



- **Ignore demand** – our baseline scenario, showing energy demand and supply to 2050 based on current known and planned UK policies. Energy demand falls by 5%. Net-zero target missed.
- **Steer demand** – same energy service demand as in 'Ignore' scenario, but incorporating other measures that aim to reduce emissions to net-zero by 2050. Energy demand falls by 31% due to energy efficiency improvements. Net-zero target missed even with very high investment in zero carbon supply and CDR techniques.
- **Shift demand** – a low energy demand scenario with changes that reduce demand for energy across the whole economy using proven technologies and under current social/political norms. Energy demand falls by 41%. Net-zero achieved with high investment in zero carbon supply and a range of CDR including engineered solutions, such as BECCS (bioenergy with carbon capture and storage).
- **Transform demand** – a low energy demand scenario that includes transformative change in technologies, social practices and behaviour, infrastructure and institutions. It is intended to generate significant co-benefits in health, local environment, affordable warmth and work-life balance. Energy demand falls by 52%. Net-zero achieved with lower supply side investment and without engineered CDR.

Our positive low energy futures approach would put UK on the right trajectory, keeping cumulative emissions in check and minimising the risk of overshooting agreed carbon budgets. The focus on energy demand opens up a greater range of mitigation actions, enabling more diversity of policy options than are currently being considered.

A positive low energy strategy will need a UK-wide energy demand delivery plan with measures that reach across the economy and bring a coherence to net-zero action that has been missing to date.





## Energy demand in a policy context

Net-zero goals are needed to avoid the worst impacts of climate change.

**Positive low energy futures** clearly shows that reducing energy demand can deliver around half of the cut in carbon emissions needed by 2050, with much less reliance on expensive and untested CDR technologies.

It can do this as well as supporting related policy objectives in health, wellbeing and the environment to improve quality of life of UK citizens.

CREDS research proposes that rapid take-up of energy efficiency measures will be needed in all low energy demand scenarios, but that it could be moderated when broader societal changes take place in tandem.

Understanding the impact of technical and social changes on energy demand gives policymakers the scope to investigate the impacts of policy trade-offs or new combinations of policy measures. For example, balancing the risks of a roll-out of new technologies – such as zero carbon heating systems – alongside the potential impact of social trends – such as a move to greater take up of plant-based diets.

We strongly urge policymakers to devise and enable a UK-wide energy demand delivery plan that takes account of the interactions between policies and that targets net-zero action as a priority.

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## About CREDS

The Centre for Research in Energy Demand Solutions (CREDS) was established as part of the UK Research and Innovation's Energy Programme in April 2018, with funding of £19.5M over five years. Its mission is to make the UK a leader in understanding the changes in energy demand needed for the transition to a secure and affordable, net-zero society. CREDS has a team of over 140 people based at 24 UK universities

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