

Achieving net zero

Ending the UK's contribution to climate change



Key points

- Meeting the net zero carbon emissions target by 2050 will require fundamental changes in all sectors of the UK economy.
- The starting point should be a step change in energy efficiency.
- New low-carbon technologies in power, transport, industry and heat will be needed at scale to achieve this target. This will require a co-ordinated, whole systems approach, and a clear policy framework, not piecemeal initiatives.
- A range of innovative frameworks for financing these technologies will be required to secure the significant capital investment required.
- Businesses have a key role to play in driving the innovation in new technologies and establishing the new industries required in a zero carbon economy.



Context

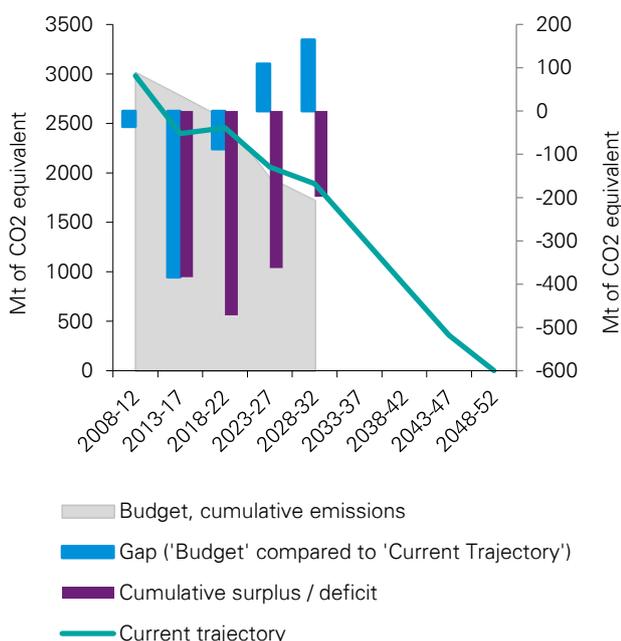
On Tuesday 11 June, Prime Minister Theresa May announced that the UK would be the first major country to legislate for a net zero target for carbon emissions by 2050, in line with the recent recommendations from the Committee on Climate Change (CCC).

This represents a significant tightening of the current 80% target set under the 2008 Climate Change Act. Achieving it will require fundamental changes across all sectors of the economy, with some sectors having to reduce their emissions to below zero (i.e. generate net negative).

emissions), to offset other sectors (e.g. agriculture) which are unlikely to be fully decarbonised by 2050. The Government has retained some flexibility to 'buy' credits from other countries who are on course to overachieve their targets, and to review progress after five years, including on whether other countries have followed suit (as the UK Government intends they should).

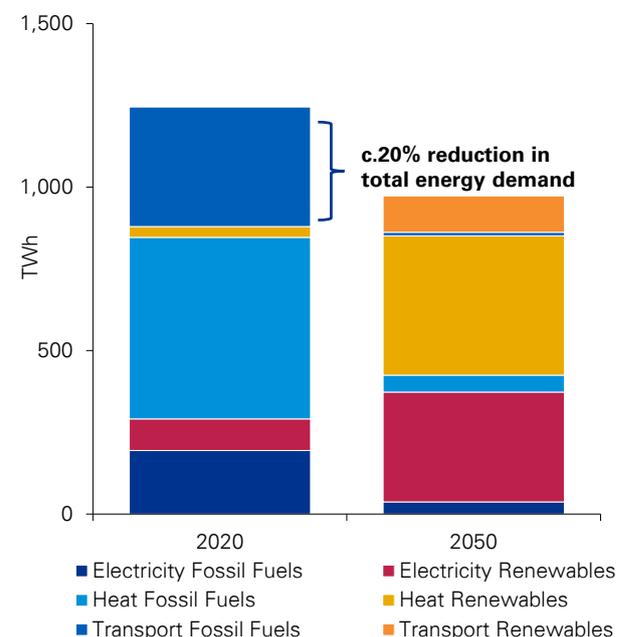
The starting point for this change has to be a step change in energy efficiency. KPMG analysis suggests that total energy demand could be reduced by around 20% by 2050 with the right policy frameworks in place.

Emissions projections and UK Carbon Budgets to 2052



Source: BEIS, Committee on Climate Change, KPMG analysis.

UK energy consumption to 2050 – a target consistent scenario



Source: National Grid FES, KPMG analysis.

01

How the challenge can be addressed

Achieving the target will drive the convergence of the power, transport and heat sectors, as we see the increasing use of electricity and (over the longer term) hydrogen in the transport and heat sectors. This, in turn, requires cross-vector, or whole systems thinking, when thinking about the pathways to 2050 and the policy measures required to get there.



Power sector

Currently at a relatively advanced stage of decarbonisation, with approximately 50% of generation now from low carbon sources. Renewables policy (including the Renewables Obligation (RO) and Contracts for Difference (CfD) schemes) have brought forward investment in at least 30GW of clean energy capacity. However, the CCC expects electricity demand in the UK to nearly double from 300TWh in 2017 to 594 TWh in 2050, which will require further large-scale buildout of renewables.

Key technologies going forward:

Offshore and onshore wind, solar, storage, hydrogen electrolysis.

Relationship to transport: The CCC expects all new car sales to be electric by 2035; creating a new source of power demand but also storage. Demand for hydrogen to power hydrogen fuel cell vehicles (HFCV) may also be produced via electrolysis from renewable sources, further raising power demand.

Relationship to heat: Large amounts of renewable electricity would be required in order to produce hydrogen by electrolysis, energy to power heat pumps (ground and air source) and other electrified heating technologies necessary to reduce the UK's reliance on LNG. The CCC estimates that as much as 305 TWh of renewable electricity would be required annually to produce the amount of hydrogen needed in 2050 using electrolysis. KPMG analysis suggests an additional c150TWh of low carbon heat would be required to meet total heat demand and, based on the CCC analysis, this additional demand could be met by a range of low carbon technologies.



Transport sector

At an early stage of decarbonisation, the UK transport sector is nonetheless expected to transition quickly as electric vehicle (EV) uptake gathers pace for passenger cars and light vans. Although EVs represent only around 1% of new car sales in the UK in 2018, EV sales were up over 60% year-on-year in April and are expected to rapidly increase to c70% in 2030 and over 90% in 2040 driven in large part by the introduction of UK Government's ban on petrol and diesel from 2040. For Heavy Goods Vehicles (HGVs), KPMG analysis suggests a greater penetration of alternative fuel sources such as HFCVs (30%) and Bio-LNG (3%) by 2040.

Key technologies going forward:

EVs, HFCVs, Biofuels.

Relationship to power: In addition to the significant increase in power demand, EV batteries are expected to offer stability to the power grid by acting as a source of flexibility in managing supply and demand between on and off-peak periods.

Relationship to heat: End-users of hydrogen and biogas in the transport sector are likely to require much of the same infrastructure and renewable fuels as end-users in the heat sector e.g. gas grid upgrades. Both sectors may therefore be part of driving the capital and critical needs case for new fuel infrastructure, and may both act as complementary sources of demand.



Heat sector

Decarbonisation of the UK's heating represents the biggest challenge, with nearly 90% of homes heated by natural gas. It will require a mix of locality-specific solutions and a range of new low carbon forms of heating (and cooling) to be deployed.

Key technologies going forward:

Technologies for residential and commercial buildings (building management systems, smart systems, demand side response (DSR), heat pumps (ground, air and hybrid) and hydrogen/biomass boilers); and industrial sectors (Carbon Capture and Storage (CCUS), process efficiency, industrial clusters, DSR).

Relationship to power: End-user appliances which offer electrified heating solutions, including heat pumps and resistive heating sources, will raise power demand. KPMG analysis suggests that more than 400 TWh of heat demand in 2050 could come from a combination of electrification and hydrogen, both of which contribute to demand for power generation.

Relationship to transport: Heat and transport may both form the basis of infrastructure funding and end-use demand for new renewable fuels (see Transport section above).



New investment frameworks will be required

Chancellor Phillip Hammond stated in his response to the CCC report that achieving the net zero target is likely to cost the UK over £1 trillion; it is therefore critical that we find ways to minimise these costs, maximise the investment and jobs created by new low carbon industries, and establish a fair way to distribute the costs.

The power sector's relative advancement in decarbonisation has been driven by widespread and investable support mechanisms aiding technology maturation and crowding in private finance. For example, the policies of renewables have helped increase the share of renewables in our power mix to 30% in 2018 from 5% in 2007; whilst the costs of offshore wind have fallen by two-thirds.

Equivalent mechanisms have yet to be established at scale for the heating and transport sectors. Innovative financing structures will be required to incentivise the requisite volume of investment in existing and emerging technologies. For example:

- Private sector players are using technological innovation (to improve project economics) and corporate Power Purchase Agreements (PPAs) (to ensure project bankability) to bring forward unsubsidised renewable projects.
- Innovative use of financing and contract structuring under Energy Performance Contracts (EPC) allows public sector organisations to undertake energy efficiency retrofit investments at minimal upfront capital cost.

However, like the range of technologies that underpin the UK's move to a net zero economy, a range of diverse financing structures will be required reflecting the different stages of technological maturity, cost and risk profiles of the different technologies.

02 Next steps

The Government is due to publish an Energy White Paper 'this summer' setting out some of the policies required to get to net zero. This is due to be followed by a 'Heat Roadmap' in the summer of 2020 setting out more detail of the policies on heat.

The CCC have stressed the need for urgency and optionality given the enormity of the challenge ahead.

The Government has already announced the ban on petrol and diesel vehicle sales from 2040, and the Future Homes Standard, which means that any new home built from 2025 can't be heated by fossil fuels.

The UK is not currently on track to hit the third or fourth carbon budgets. Therefore, significant further policy measures will be required in the forthcoming Government policy statements if the UK is to be on track to hit net zero.

This could include measures such as:

- a step change in funding for energy efficiency (spending on which has been cut significantly since 2010);
- clearer long-term carbon price signals across all sectors;
- new gas quality standards to allow greater blending of biomethane and hydrogen in the gas network;
- tightening of new building regulations to encourage energy efficiency and investment in low carbon forms of heating;
- funding for full-scale deployment of a hydrogen network in a City Region and the establishment of industrial clusters based on hydrogen and CCUS.

Given that heat is, by definition, a local issue, local authorities, Local Enterprise Partnerships (LEPs), City Regions and Devolved Administrations have a crucial role to play in shaping the right solutions for their areas.

Business also has a key role to play in coming forward with solutions and in shaping this debate over the coming months. Achieving net zero will mean the creation of new industries and supply chains; new business models and new operating models. Solutions need to be developed that work for energy consumers now and in the future.

As we transition into this new world, businesses should consider:

- New routes to market created as an integrated value chain emerges across power, heat and transport;
- Means to insulate against power price exposure for electricity heavy operations as peak demand volatility increases;
- Opportunities for intelligent energy management as energy consumption becomes a major contributor to operational costs;
- Pre-emptive supply chain management to mitigate exposure to import costs associated with countries have not committed to similarly aggressive decarbonisation targets.

Only by business, consumers and government working together to maximise the opportunities and minimise the costs involved in reaching net zero will the UK be able to end its contribution to climate change.



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