



Transforming UK homes: achieving a 60% cut in CO₂ emissions by 2050

Why Market Transformation

The UK target for a 60% cut in CO₂ from homes by 2050 is challenging given increases in the number of homes and in the demands for more heat, hot water, light and appliances.

Market Transformation, aimed at reduced carbon emissions, uses a mixture of information, incentives, and regulation to transform the market for a given product. Widely adopted across the globe for appliances, here the transformation approach is extended for new build and existing homes, for micro-generation and for lights and appliances.

A computer model has been developed, and validated against historical consumption, to describe the evolution of the stock of homes to 2050. Sensitivity analysis has been used to test the importance of a number of assumptions (eg population and climate). The model is used to explore policy scenarios for market transformation and can powerfully inform policy design to reduce CO₂ and could provide an architecture for other EU countries facing similar policy targets.

The UK Domestic Carbon Model v2

A model of energy use in homes has been developed which will be open access, allows sensitivity and scenario analysis and is developing a similar model of energy use in non-domestic buildings. This will form the basis for detailed discussion of trends and policy options with stakeholders.

The model, written in IDL, is a bottom-up energy balance model. It includes all sources of heat (lights and appliances, hot water, solar gain, occupant energy) and all losses (walls, windows etc). It included data from 1996 base year and projected to 2050.

As part of the development of the Model BMT has:

- Compared modelled consumption to actual energy supplied over 30 quarters of DTI data from *Energy Trends*
- Conducted error analysis. Since estimates of the level of loft installation installed or airtightness of buildings in stock are inaccurate, the models sensitivity to these inaccuracies has been examined

- Conducted sensitivity testing on future assumptions like population, number of households and internal/external temperatures
- Built three policy scenarios (Fig 1)
 - A. Incremental change – based around current policies and technologies
 - B. A 40% Scenario
 - C. Extreme change – a 50% reduction by 2030 is possible with a 75% reduction by 2050

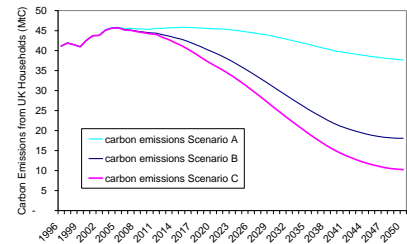


Fig 1 Scenarios for energy used in lights and appliances out to 2050 :

the Market Transformation Scenario

New Builds

Need to establish zero carbon in new build by 2020 with intermediate steps in 2015 and 2010

The EU Energy Efficiency Action Plan calls for zero carbon homes by 2016 (European Commission 2006)



Point of sale and launch of 'Home Energy Rating' provide major opportunities

existing builds



Other market transformation opportunities include:

- > Increased label visibility
- > Obligation on mortgage providers to lend for refurbishment
- > Requirement for householders to achieve certain improvements

Major efficiency improvements are required in: refrigeration, consumer electronics and lighting

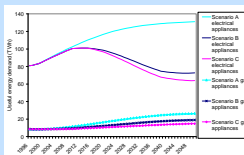


Fig 2: Scenarios for energy used in lights and appliances

lights & appliances



Minimum Efficiency Standards under the *EU Energy Using Products Directive* must play a key role

3 opportunities for homes to generate and consume equal amounts of carbon:

- > **Combustion:** generate heat and electricity (as CHP)
- > **Rooftop:** PV, solar thermal, micro-wind
- > **Rural:** biomass of heat pumps

Demand for gas may decline and be used substantially in CHP rather than in heat-only applications. (see graph)

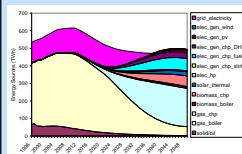


Fig 3: Energy supplied from a range of sources out to 2050 (Scenario C)

Micro-generation

Change may be organisational with key role for Energy Services Companies.

Model shows Consumption is hugely varied by behaviour and is only loosely related to dwelling type.

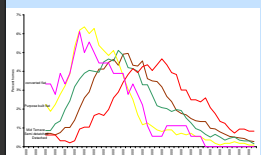


Fig 4: Distribution of gas use by house type

For the same dwelling type, consumption can vary by an order of magnitude (English House Condition Survey Datasets 1996)

For high consuming households technical intervention could mean making same savings with few installations

behaviour

Behaviour is important & key element of policy.

Behaviour is being examined by UK Demand Reduction Pilot in 2007



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