



THE OXFORD
INSTITUTE
FOR ENERGY
STUDIES

A RECOGNIZED INDEPENDENT CENTRE OF THE UNIVERSITY OF OXFORD



The importance of the demand-side

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One message

Demand matters

(and should be integrated into policy on decarbonisation)



Three questions

- 1 Why is an **integrated** approach so important for decarbonisation?
- 2 What would a demand-side strategy look like in principle and how would **energy efficiency** fit in?
- 3 What are the **challenges** on the demand side?

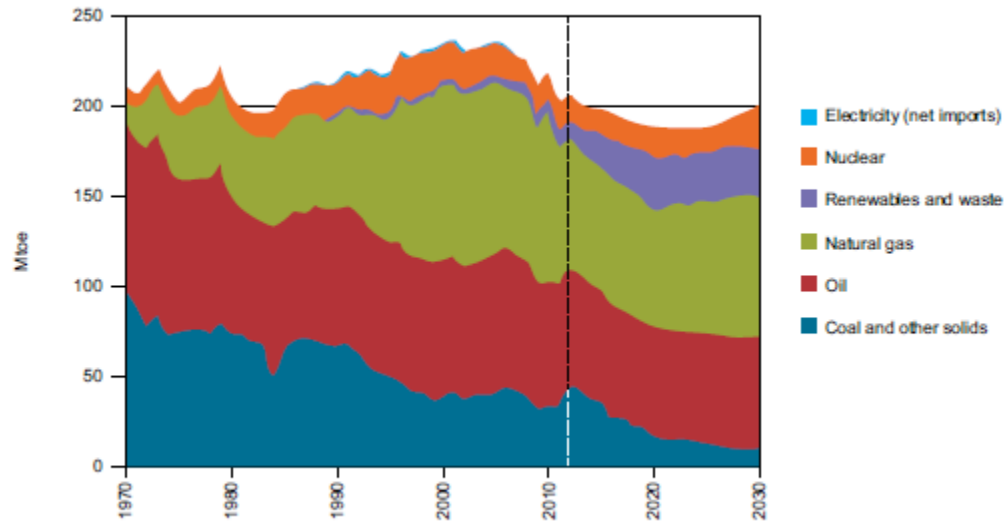
Government low carbon strategy

- **Energy efficiency** – the “immediate priority” (UK Carbon Plan)
- **Decarbonise** electricity via EMR etc “over the next decade” (UK Carbon Plan)
- **Electrify** other sectors (heating, transport etc) “during the 2020s” (UK Carbon Plan)
- **ETS** (“cornerstone” of EU strategy (EU Environment Ministers 2012); hardly mentioned in UK Carbon Plan – “not enough on its own”)



The need for an integrated approach: fuel mix changes don't look radical....

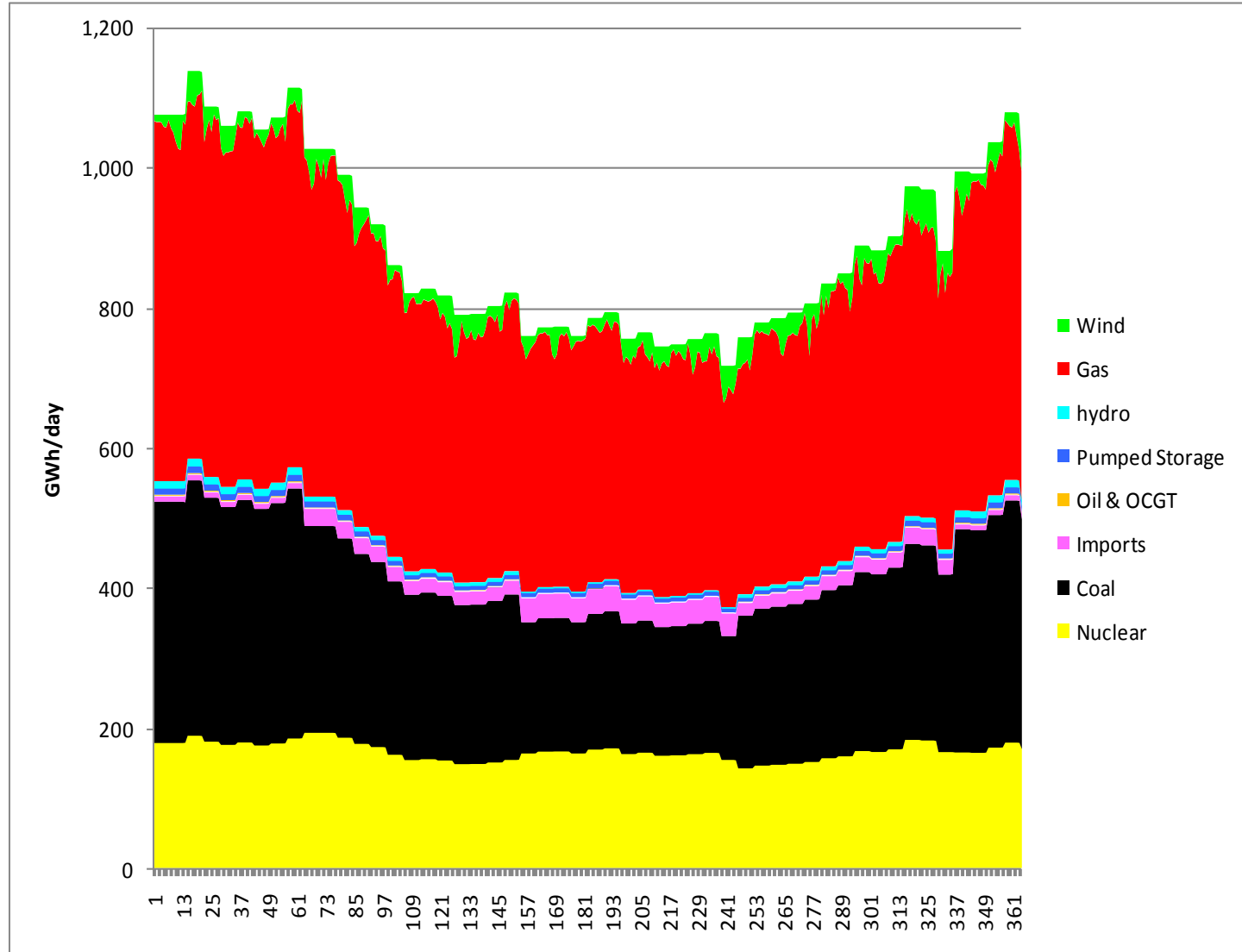
Figure A: Inland primary energy consumption, million tonnes of oil equivalent



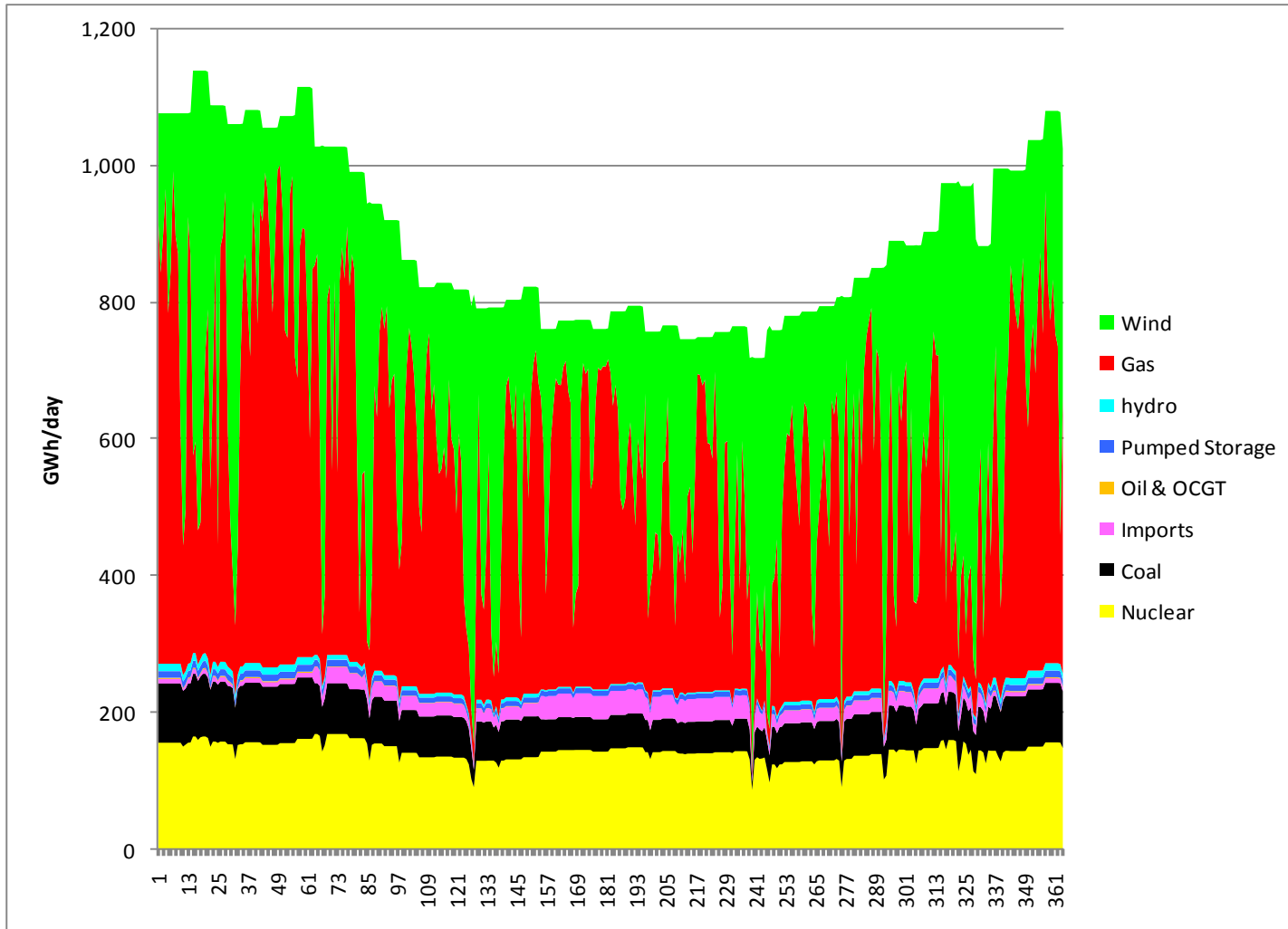
Source: DECC, *Digest of UK Energy Statistics and Updated Energy Projections*, October 2012

But in practice they fundamentally change the system

UK Sources of Power Generation 2009 – Daily (3.8 GW Wind Capacity)

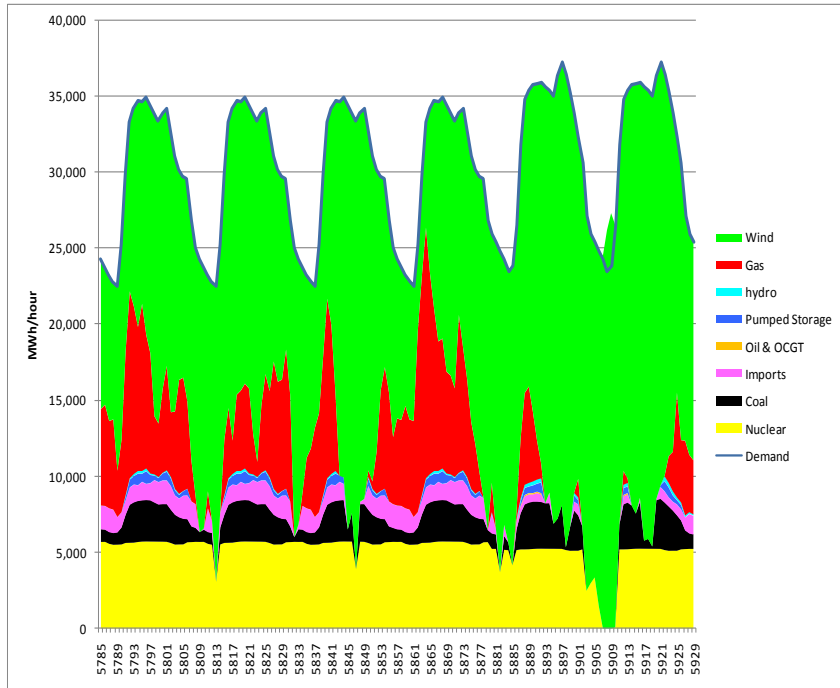


UK Sources of Power Generation 2025 Daily (43.2 GW Wind Capacity)

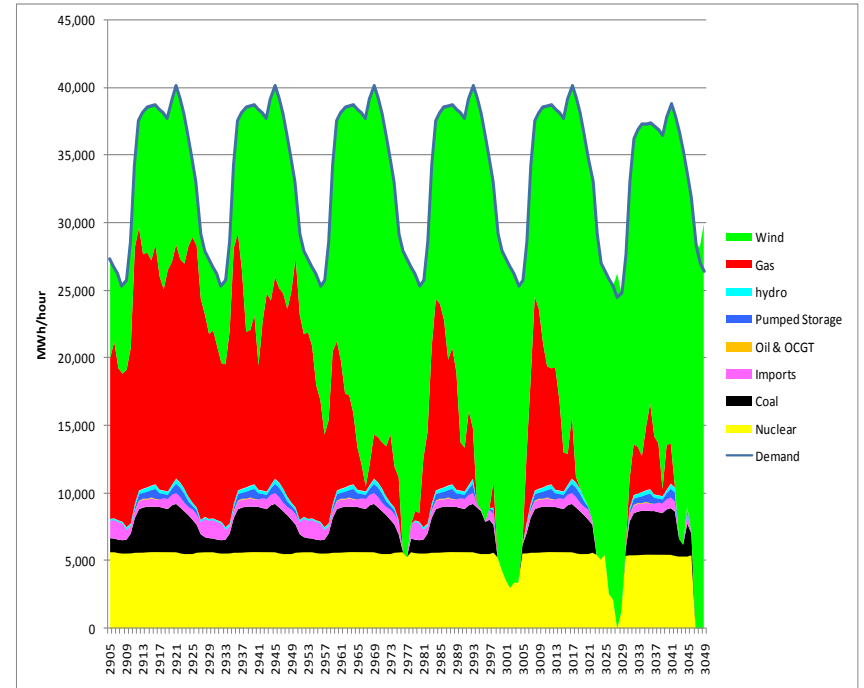


2025 Hourly Analysis

Days 121 – 127



Days 241 – 247



EMR – more than just slotting in one form of investment for another. The electricity industry is “turning upside down”

	NOW	FUTURE
Cost structure	Mainly marginal	Mainly capital
Pricing	kWh	?
Planning and operation	Flex supply to match demand	Flex demand to match supply
Control and dispatch	From centre	Throughout system (cf internet)
Role of demand-side	Passive	Interactive
Role of grids	Neutral conduit	Smart player



What would a demand-side strategy involve?

1. **Reducing demand** for high carbon fuels
2. **Switching demand** from high carbon energy to low carbon energy
3. Creating a **more active demand-side** for demand response

Little or none of this is being done on the demand-side – though watch this space in the Energy Bill.



1 Reducing demand: the policy discussion conflates energy efficiency and energy reduction

“Energy efficiency is the most cost effective way to reduce emissions [and] improve energy security [It] can be seen as Europe's biggest energy resource”

(Commission – Energy 2020)

“Reducing demand for energy is the cheapest way of cutting emissions and will also benefit consumers and our economy”

(UK Carbon Plan)



How does energy efficiency fit in?

- May or may not reduce demand
- Not targeted at high carbon sources
- Does little or nothing to encourage switching to low carbon sources
- Does little or nothing to encourage an active demand-side

Energy efficiency is about energy – the problem is carbon



Some policy interactions

- Decarbonisation of electricity reduces (cost-effectiveness of) carbon savings from energy efficiency – ECO; Green Deal etc
- Lower demand/decarbonisation lowers ETS prices
- Some forms of energy efficiency discourage fuel-switching (eg CHP; efficient vehicles)



2 Fuel switching: we have three separate energy sectors

- Oil/transport (nearly 100%)
- Gas/heating (around 80%)
- Electricity/appliances

Sectors and energy sources have different (currently matched) characteristics – it will take a lot to make people change.



2: Fuel switching – the scale of the changes needed

Heating biggest single household load (c 150 GW vs c 60 GW electricity)

- Heat pumps (the favoured option) likely to require peaking support, high insulation levels and time-shifting ability

Transport – very high on power demand; less so on energy

- EVs (the favoured option): charging slow; but would need to be time-shiftable.

In both areas, we don't really know what consumers will accept; what incentives they will need; or how the electricity system will cope.



Policy interactions: decarbonising electricity does not encourage switching

Table 2.6 Carbon Prices assumed (£/tonne CO₂)²⁶

£/tCO ₂ , 2012 Prices	2011	2012	2013	2014	2015	2016	2020	2025	2030
Industry & Commerce (EU ETS price - no carbon price floor)	12.3	5.8	6.0	6.2	6.4	6.7	8.6	10.3	12.3
Electricity Supply Sector (with carbon price floor support)	12.3	5.8	9.6	14.2	19.9	23.6	32.4	54.0	75.6



3 Demand side potential: problems of assessment

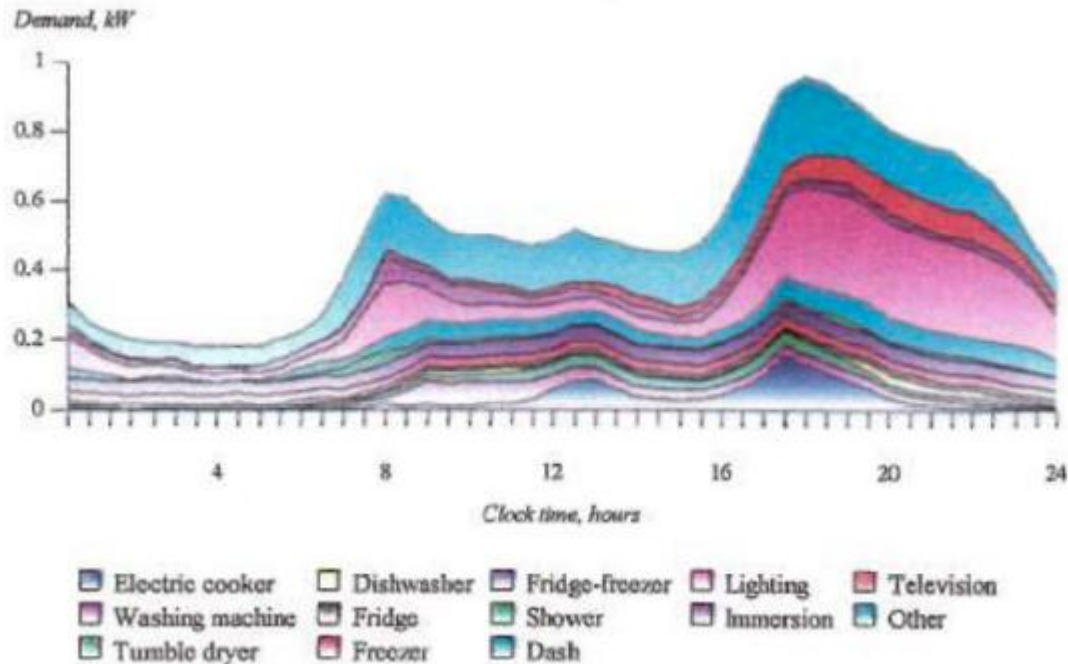
- Prices give inadequate signals
- Few markets. Current demand side STOR c 1GW – but mainly with on-site back-up
- Significant demand side bidding in other systems (eg PJM) but based on supply companies
- Future structure and shiftability of different types of demand uncertain



Winter electricity use by average consumer

(Load Research Ltd)

The Average Unrestricted Domestic Customer - End-use Breakdown
Winter Weekday at 42°F



Winter electricity use by Economy 7 user

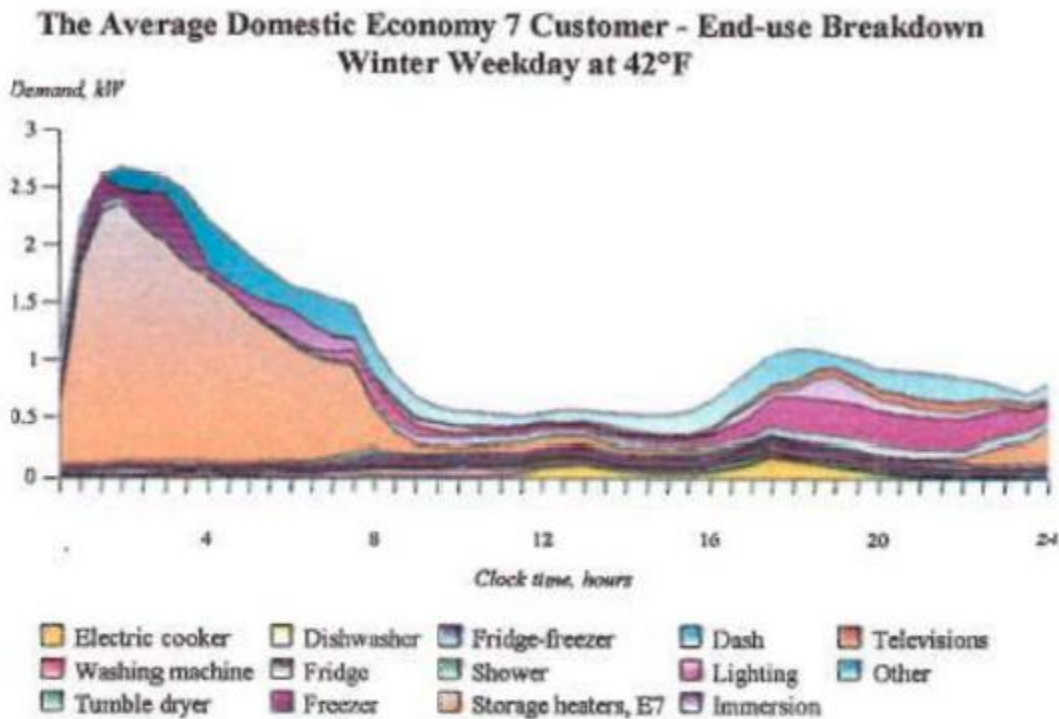


Figure 7: Winter weekday domestic end use breakdowns from Load Research Ltd

Source: website of Load Research Limited.



Some Issues – retail and wholesale prices

- More active demand-side needs more sophisticated pricing, metering and consumer engagement
- Present policy is to simplify tariffs and reduce need for consumer engagement
- Many “ancillary” costs “socialised” – but they will be the main cost component of a future system
- Not clear what will happen to EMR costs, but likely to blur price signals



Conclusions

- Demand has received too little attention in relation to climate change policy
- Energy efficiency has been over-emphasised and treated too simplistically
- Nonetheless, in future, the demand side will take on a much greater potential role as energy markets decarbonise
- Governments will need to develop a coherent and integrated strategy to harness this potential effectively

