



Powering the Future

Mapping our low-carbon path to 2050

Summary points

October 2009



Introduction

- **Focuses on reduction commitments for 2050**
- **Contributes to government roadmap debate**
- **Holistic approach across the UK economy**

Explores interactions between sectors
Considers best sequencing of actions



Study drivers

- **Rapidly developing climate change debate**
- **Substantial role across many sectors provides opportunity to drive radical change**
- **Reflects our ethical position on sustainability**
- **Challenge matched by our multi-disciplinary skill base**



Broad approach

- Study based on government published statistics
- All technically feasible options considered
- Effectiveness rather than cost was primary driver
- Conservative assumptions over technology, timing and scale of actions



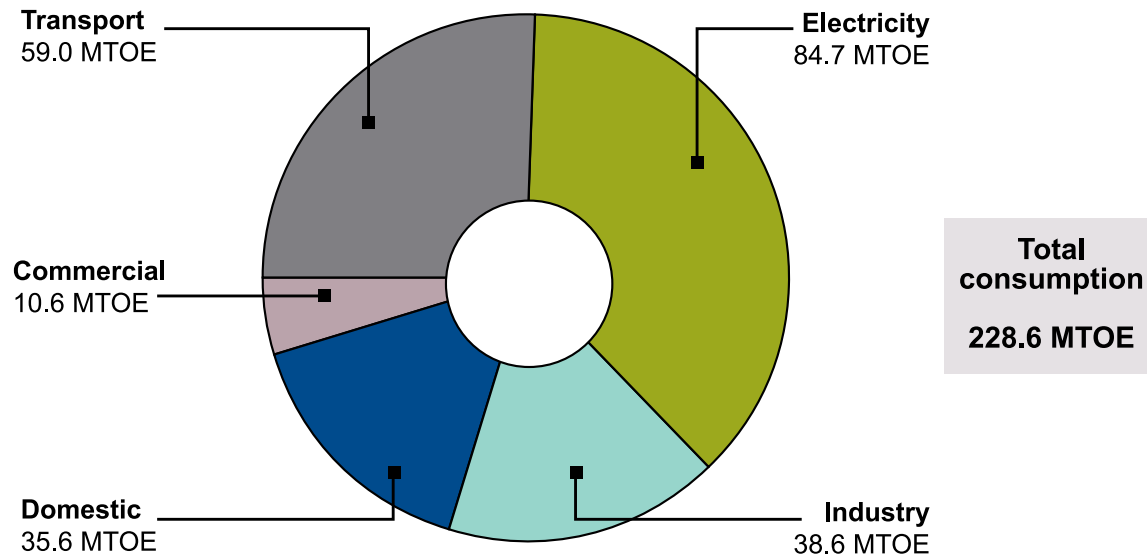
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Study objectives

- **Contribute to debate on strategies for delivering 2050 commitments**
- **Identify potential sector measures and evaluate their effectiveness**
- **Assess the impact of alternative groups of measures on the UK economy**
- **Review implications of alternatives on diversity of technology and fuels**

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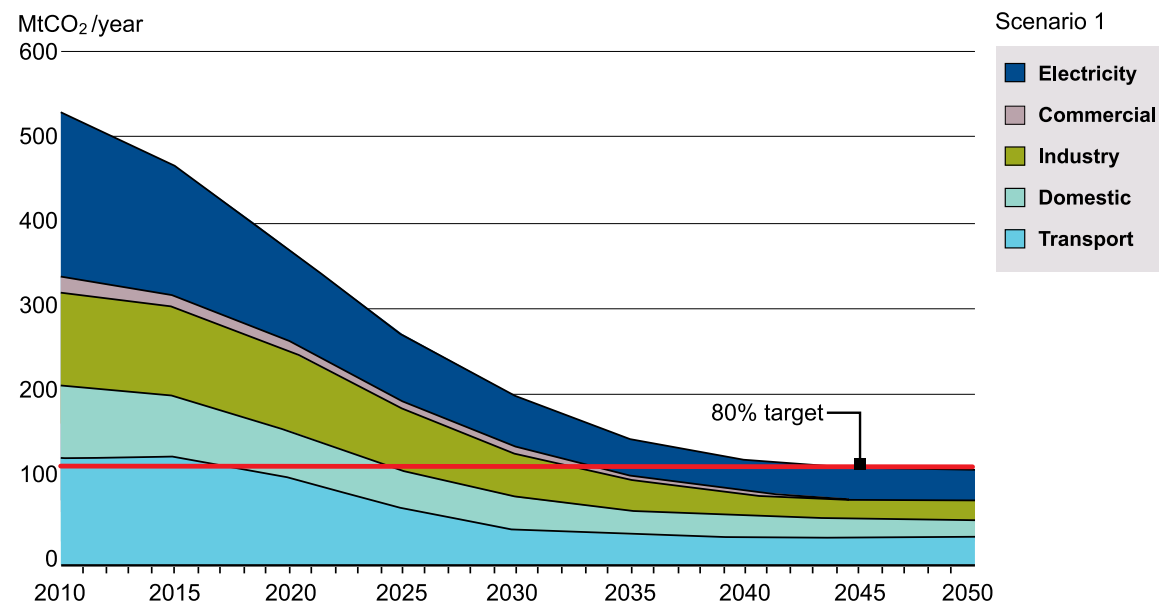
Breakdown of primary energy consumption by sector 2006



UK sector overview

- **Transport:** 26% fossil fuel consumption; 22% CO₂ emissions
Road travel using diesel and petrol dominates consumption
- **Industry:** 17% fuel; 24% CO₂
High emissions from energy intensive industries
Consumption mix gas (40%), oil (24%), electricity (24%) and coal (11%)
- **Domestic:** 16% fuel; 15% CO₂
Consumption dominated by gas (70%) and electricity (22%)
- **Commercial:** 5% fuel; 5% CO₂
Wide range of groupings, 80% of consumption dominated by commercial buildings and public administration
- **Electricity:** 36% fuel; 34% CO₂
Operations solely determined by demand from other sectors
Forecast capacity to fall to half current value by 2023

Overall CO₂ emissions trend for UK by sector for reference scenario



Strategic findings

- **Achieving 80% reduction in CO₂ by 2050 is feasible** but every sector must make radical changes
- **All effective measures need to be applied to their maximum feasible level**
- **Markets alone can not deliver required scale of change**
- **Sustained strong government leadership required**
- **Long-term economic management must recognise link between GDP growth and CO₂ emissions**



Sector interactions

Changes in different sectors are found to have the potential to interact and create synergy or conflict, for example:

Wind/electric vehicle synergy

- **Issues:**

Wind intermittency results in reduced electricity reliability
Electric vehicles have large charging demand

- **Consequence:**

‘Smart grid’ controlled charging allows intermittent supply from wind to be used effectively



Sector interactions

Nuclear/CCS conflict

- **Issues:**
Nuclear generation provides proven baseload capacity
CCS offers alternative but unproven baseload capacity
- **Consequence:**
Omission of nuclear programme results in dependency on unproven CCS technology



Transport

- **80% of road fuel consumption displaced by electric cars and vans by 2050**
Will consume half of all electricity at that time
- **Large-scale development in public transport essential to reduce road vehicles**
- **Vehicle efficiency improvements not sufficient for 2050 but an important transition measure**
- **HGVs present challenge and require new technology development for sufficient carbon reduction**



Industry

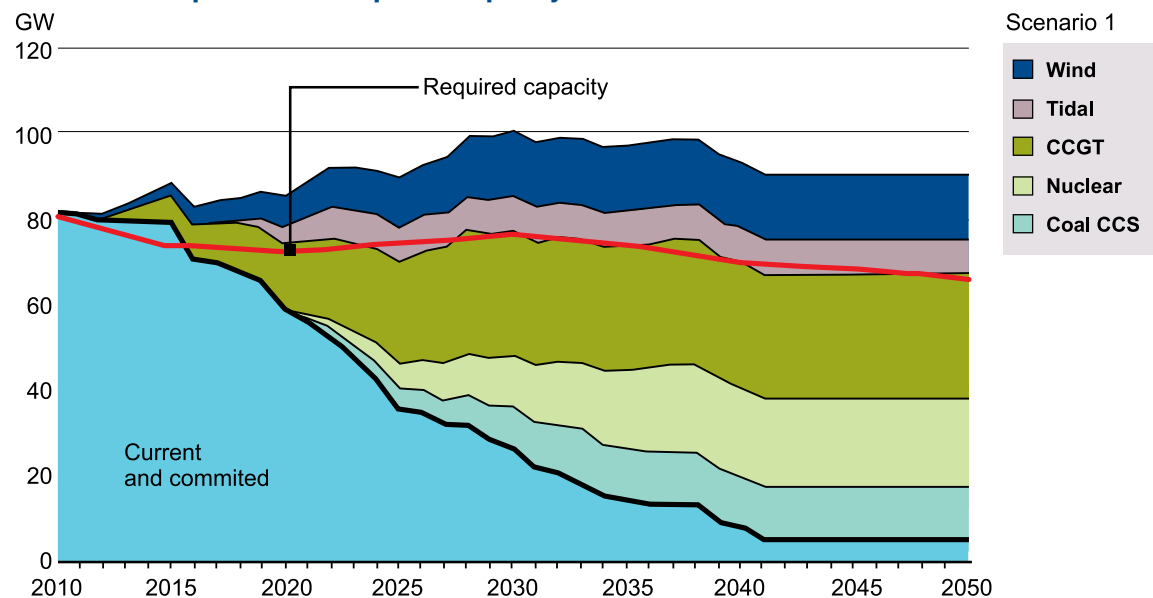
- Industry requires unprecedented investment in carbon efficiency measures
- Risk of high costs driving vulnerable production overseas causing substantially increased global emissions
- UK and EU government intervention will be essential to maintain industrial competitiveness
- Essential to apply carbon capture technology to energy intensive industries



Domestic and commercial

- **Radical and early improvement in domestic and commercial building insulation is essential**
- **Biomass heating and solar hot water deliver valuable improvements for these sectors**
- **Embedded renewables in domestic, industry and commercial sectors provides significant contribution**

Installed compared with required capacity for the reference scenario



Transforming electricity

- **UK generating capacity is forecast to fall to half its current levels by 2023**
- **Maintaining capacity will require an unprecedented construction programme**
- **Anticipated new build required in this sector will include:**
 - 12-28 GW gas CCGT
 - 16-21 GW nuclear
 - 7-15 GW coal CCS
 - 4-8 GW tidal
 - 10-30 GW wind
 - 0-18 GW open cycle GT
- **Embedded generation anticipated by 2050**
 - 10-20 GW combined heat and power
 - 5-20 GW wind
 - 10-40 GW solar PV



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Future work necessary

- **Policy development**
Review of markets related to carbon reduction
Establish means of coordinating carbon reduction policies
- **UK capability development**
Promote development of skills and capacity
- **Sector-specific work**
Identify preferred strategies
Promote measures
Support rollout

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Summary

- **Achieving 2050 targets is feasible; strong government leadership essential**
- **Consistent and coordinated approach is essential**
- **Radical actions required now across all sectors**
- **Focus required on 'quick wins'**
Buildings insulation, electric vehicles and industrial efficiency
- **Leadership on generation mix required**



For enquiries relating to Powering the Future,
please contact:

Paul Willson, lead author
Deputy Director of Generation
willsonpa@pbworld.com
44-(0)161-200-5210

Maria Laffey
Marketing Communications Manager
mlaffey@pbworld.com
44-(0)191-226-2565

www.pbpoweringthefuture.com
www.pbworld.com/ea