

**Delivering GHG reductions  
and Energy Security:  
*UK Climate Change  
and Energy Policies***

**Dr Nafees Meah**  
LCS-Rnet Meeting:  
Berlin, 20-21 September 2010

# Our policy objectives – ‘Annual Energy Statement’ 27 July 2010



- 
- Reduce energy use by households and businesses – ‘Green Deal’
  - Deliver secure energy on the way to a low carbon future
  - Drive ambitious action on climate change at home and abroad
  - Manage our energy legacy responsibly and cost effectively

# Climate Change Act 2008 created an ambitious legal framework to tackle climate change



## **Ambitious targets to reduce emissions**

- Requiring us to cut emissions by at least 80% by 2050 relative to 1990 levels, and by 34% by 2020

## **Binding carbon budgets**

- Five-year carbon budgets set three budget periods ahead; first three budgets cover the period 2008-2022
- Set the trajectory towards the 2020 and 2050 targets, and ensure that cumulative emissions are limited.

## **A clear accountability framework**

- A requirement to introduce policies to meet the carbon budgets
- Established the Committee on Climate Change to advise Government on its budgets and how to meet them, and scrutinise delivery through annual progress reports.

# Carbon budgets are the first system of their kind anywhere in the world



## A concrete reporting cycle set through UK law

- Setting limits on emissions for each five year period
- Set fifteen years in advance to give long-term certainty – carbon budget for 2022-2026 to be set 2011
- regular reporting to Parliament, and scrutiny by the CCC

## Genuine financial consequences if budgets aren't met

- Climate Change Act means carbon budgets have to be met
- Any shortfall would have to be met by purchase of international credits
- For a significant shortfall, this could run to £billions

## Going beyond international commitments and ensuring their delivery

- A higher level of ambition than our international commitments require
- A clear framework enshrined in domestic law for delivering economy wide emissions cuts

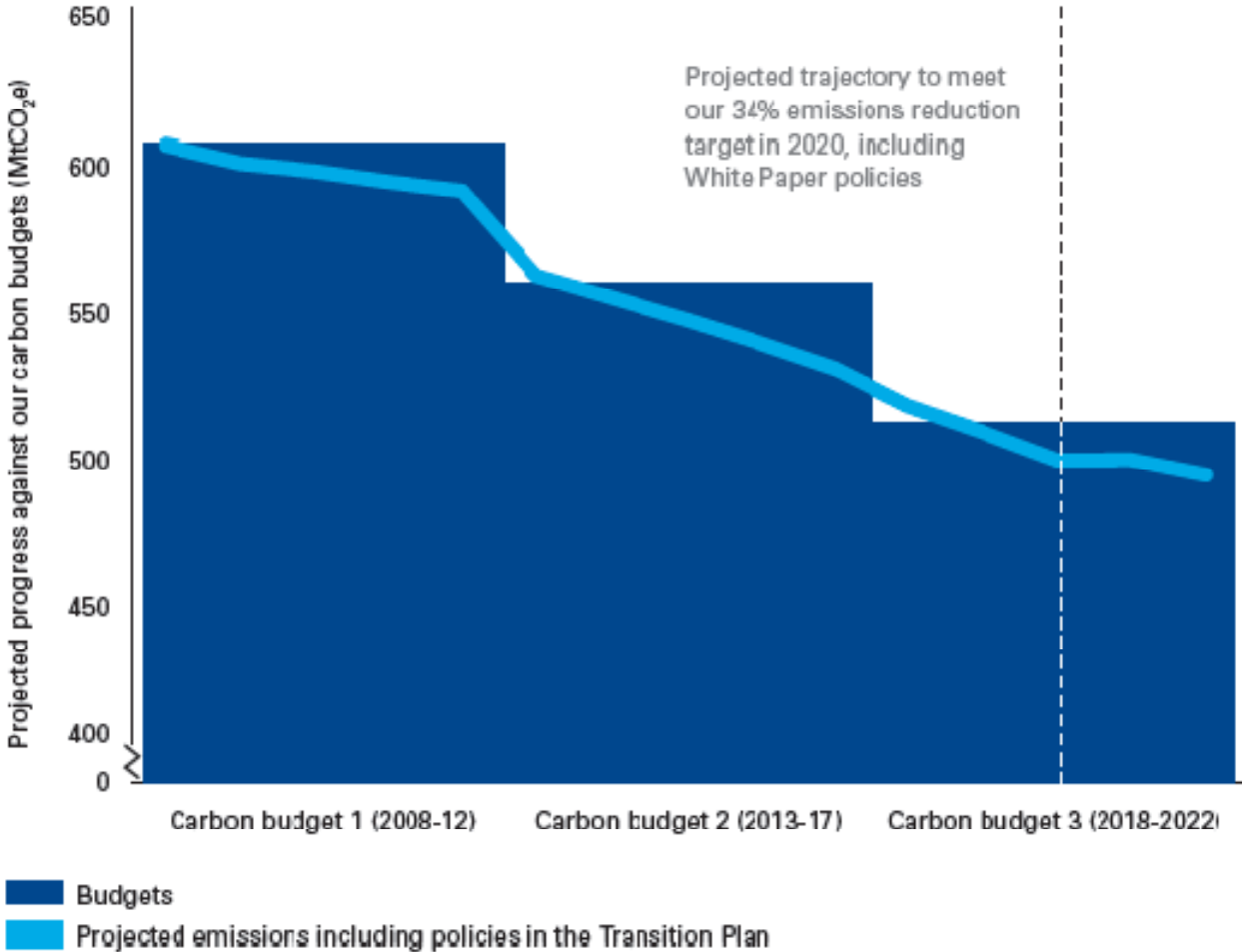
# The Government will drive the transition to a low carbon UK using our legally binding carbon budgets



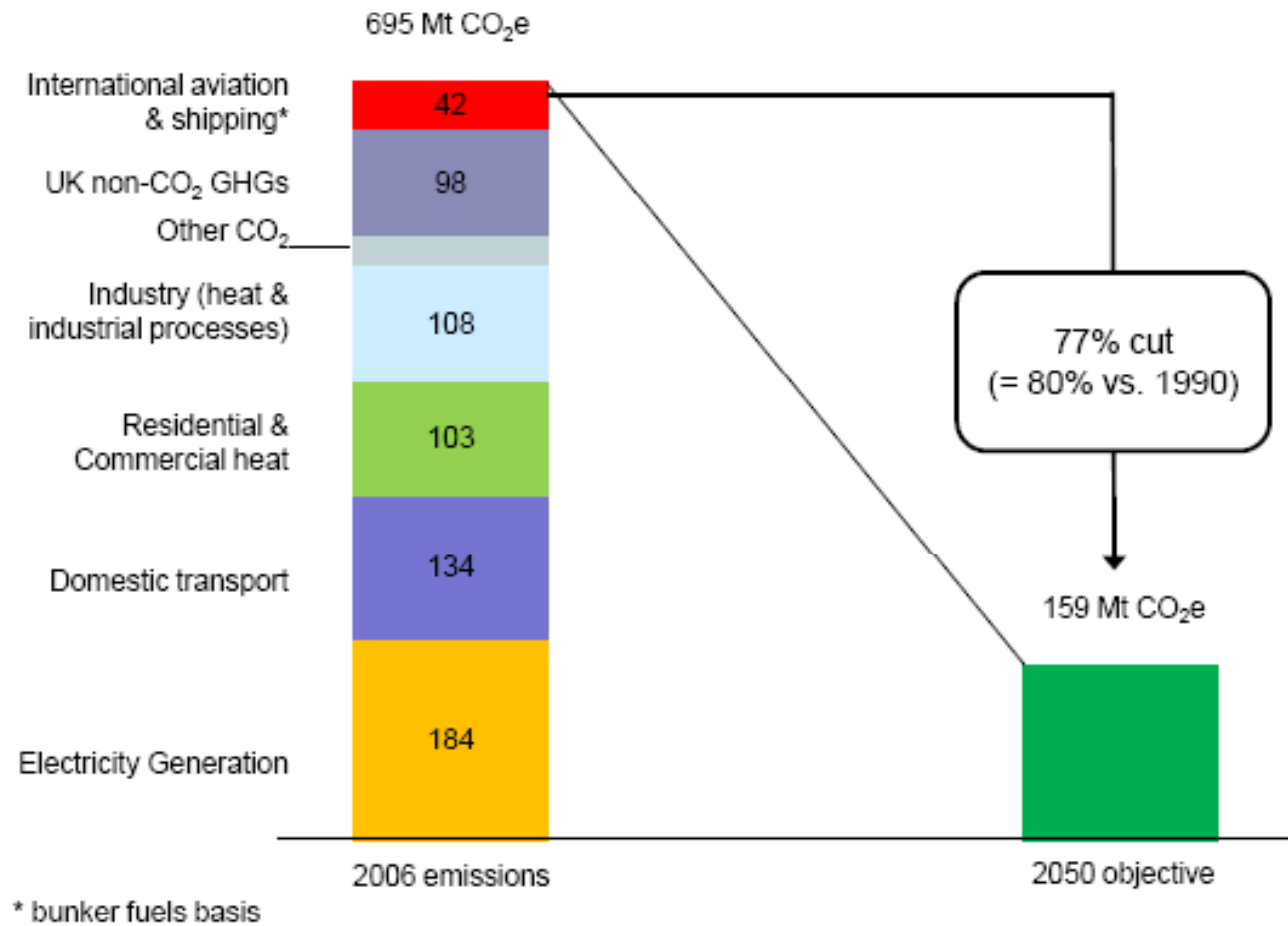
Carbon budgets are equivalent to a **34% cut in greenhouse gas emissions in 2020.**

....and will be **tightened** after a successful global deal – around 42%??

The UK will also cut emissions by **80% by 2050.**



# Delivering this level of ambition will be a huge challenge...



# Achieving this will require big changes across our economy



At the heart of our approach is the **EU Emissions Trading System** which sets a declining limit or 'cap' for emissions from electricity generation and heavy industry

Further action decarbonising power: **renewables, CCS, new nuclear and smarter grid**

**Greener homes and communities** (energy efficiency, community level measures, price support...)

**Transforming our transport system** (ultra-low carbon vehicles, behaviour change, electrification)

**Transforming our agriculture and use of land** (using new methods, voluntary action, waste to energy)

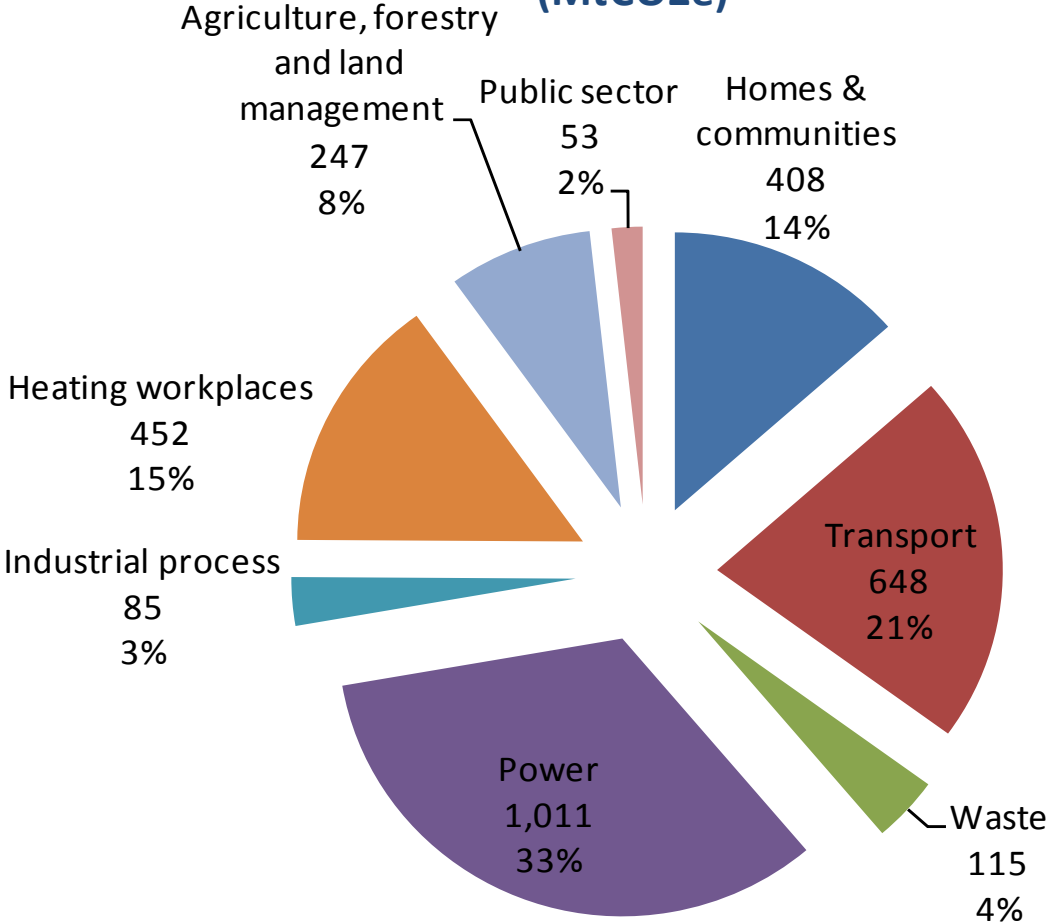
Measures to help make the UK a **world centre of the green economy**

So action on all fronts, to **transform the way we power and heat our homes and workplaces, travel about, manage our land...**

# Indicative sector shares of the UK Carbon Budgets



### UK Carbon Budget 2008-2012 (MtCO<sub>2</sub>e)





# We have established the independent Committee on Climate Change to keep us on our toes...

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## CCC advise on:

- the levels of emissions reduction targets and carbon budgets
- the contributions that different sectors could make
- the extent to which offsetting could be used to meet the budgets
- Produce annual reports to Parliament on progress against the carbon budgets

## How does it add value?

- High profile, independent, expert Committee providing high-quality advice to Government
- Accountability – ‘walking the walk as opposed to talking the talk’
- Praise and Shame

# CCC's second annual progress report June 2010: Key recommendations



- Emissions reductions in 2009 largely due to recession
- Should aim to outperform first budget and not bank to second budget

- Step change still needed in pace of emissions reductions
  - Limited progress on measures
  - Some progress on policies but further action required

Incentives for investment  
in **low carbon power**:

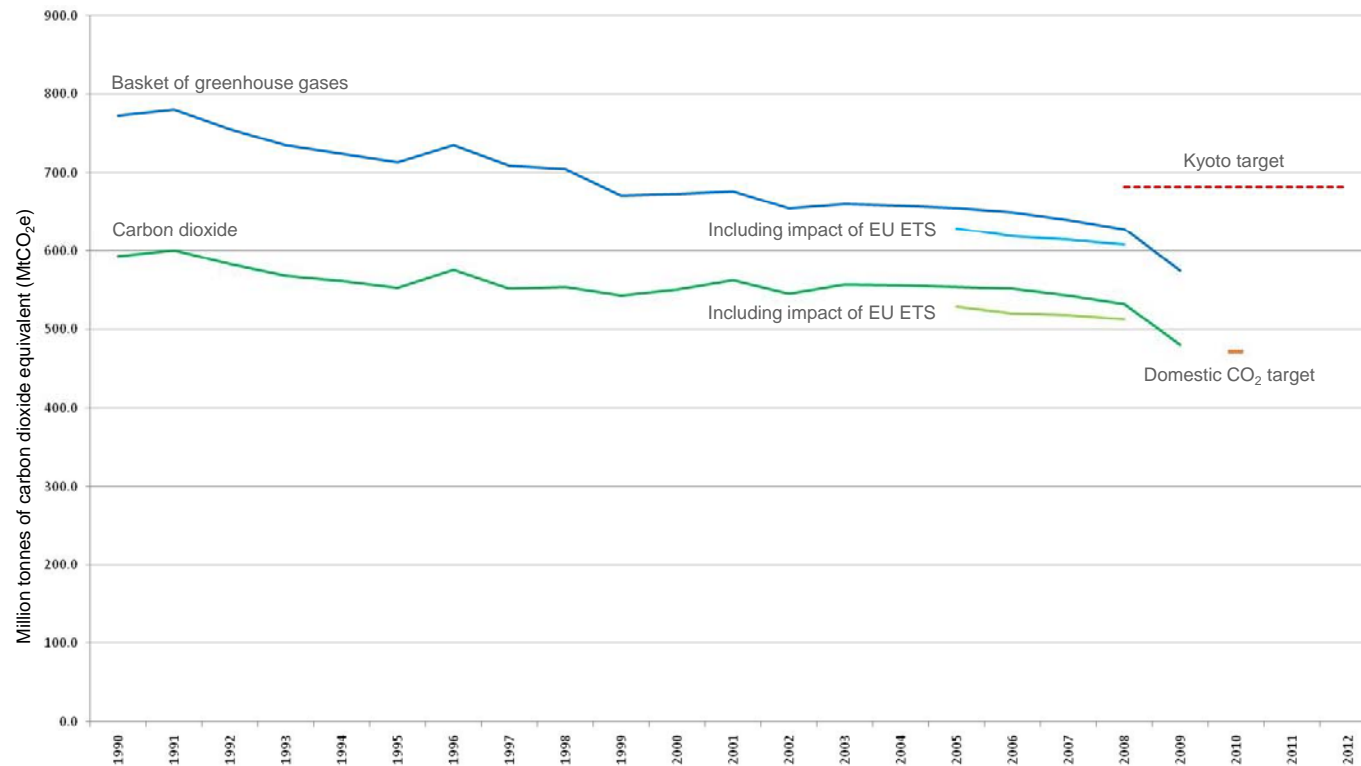
Electricity market reform  
Carbon price floor  
Emissions Performance Standard

Delivery mechanisms and incentives to improve **energy efficiency of buildings**

New policies for the **agriculture** sector

Encouraging a move to more **carbon-efficient cars**, including electric cars

# UK greenhouse gas emissions: progress towards targets and carbon budgets



2009 figures are provisional

Source: AEA, DECC

- **2008 GHG** emissions down by **19.4%** on 1990 levels (**22%** including impact of EU ETS)
- On track to almost double Kyoto commitment of 12.5% reduction in 2008-2012
- **2008 CO<sub>2</sub>** emissions down by **10.1%** on 1990 levels (**13.5%** including impact of EU ETS)

## Developments since the Coalition Government took office



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Stimulating investment through:

- Electricity Market Reform – consultation this autumn, followed by a White Paper in spring
- Carbon Floor Price/ Support – proposals to be published in the autumn to reform the climate change levy
- Proposals on the establishment of a Green Investment Bank will be published this autumn

## Developments since the Coalition Government took office



‘Greener Living’ and individual behaviour change

- Tackling the barriers to investment in energy efficiency by launching the “Green Deal”
- Rolling out “smart meters”
- Introduction of a 10% reduction target to be achieved within 12 months for Government departments

## Our priority evidence needs

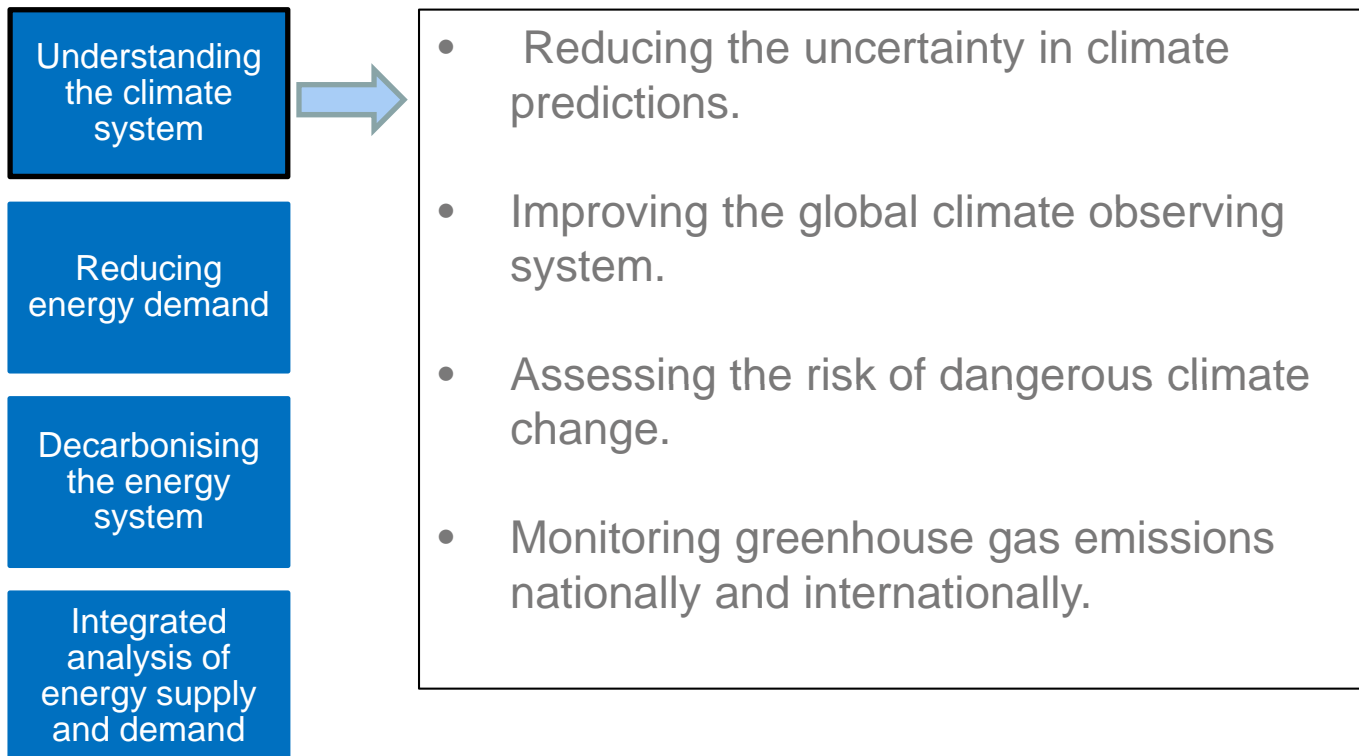
Understanding  
the climate  
system

Reducing  
energy demand

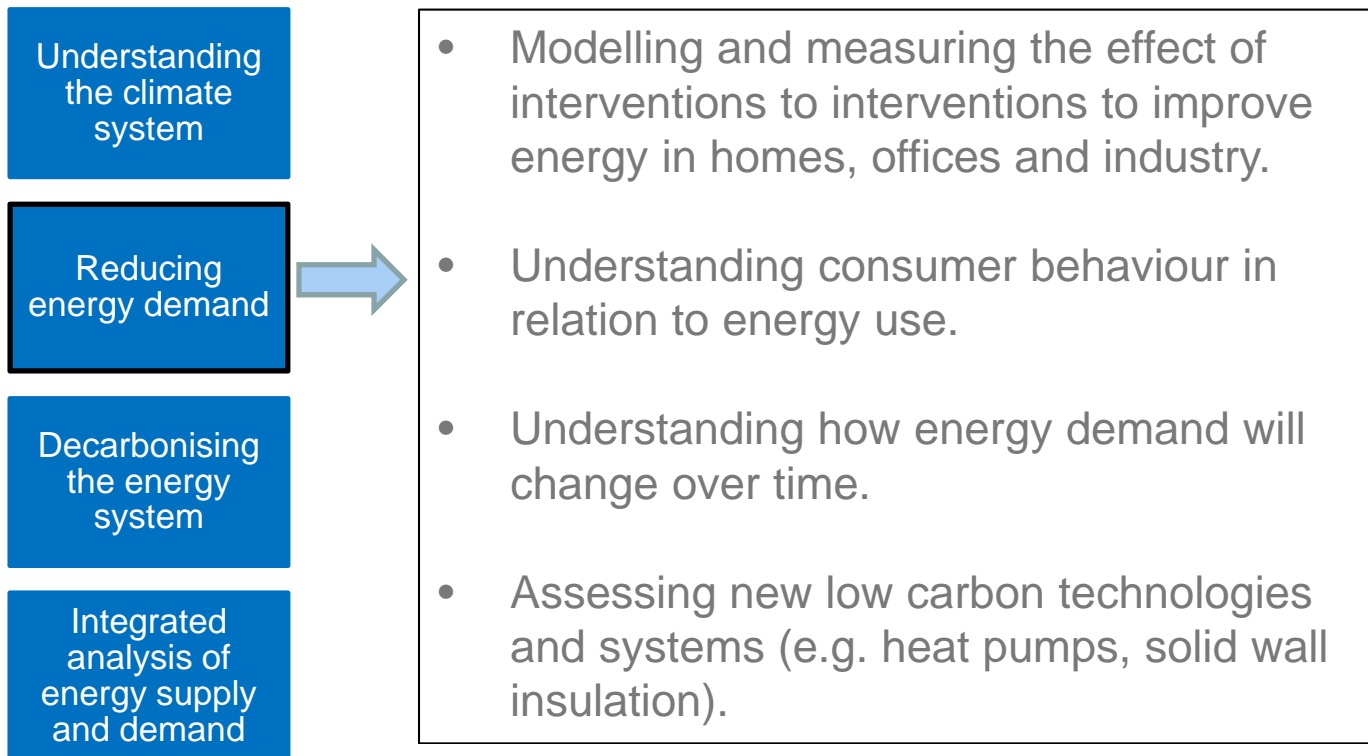
Decarbonising  
the energy  
system

Integrated  
analysis of  
energy supply  
and demand

# Understanding the climate system

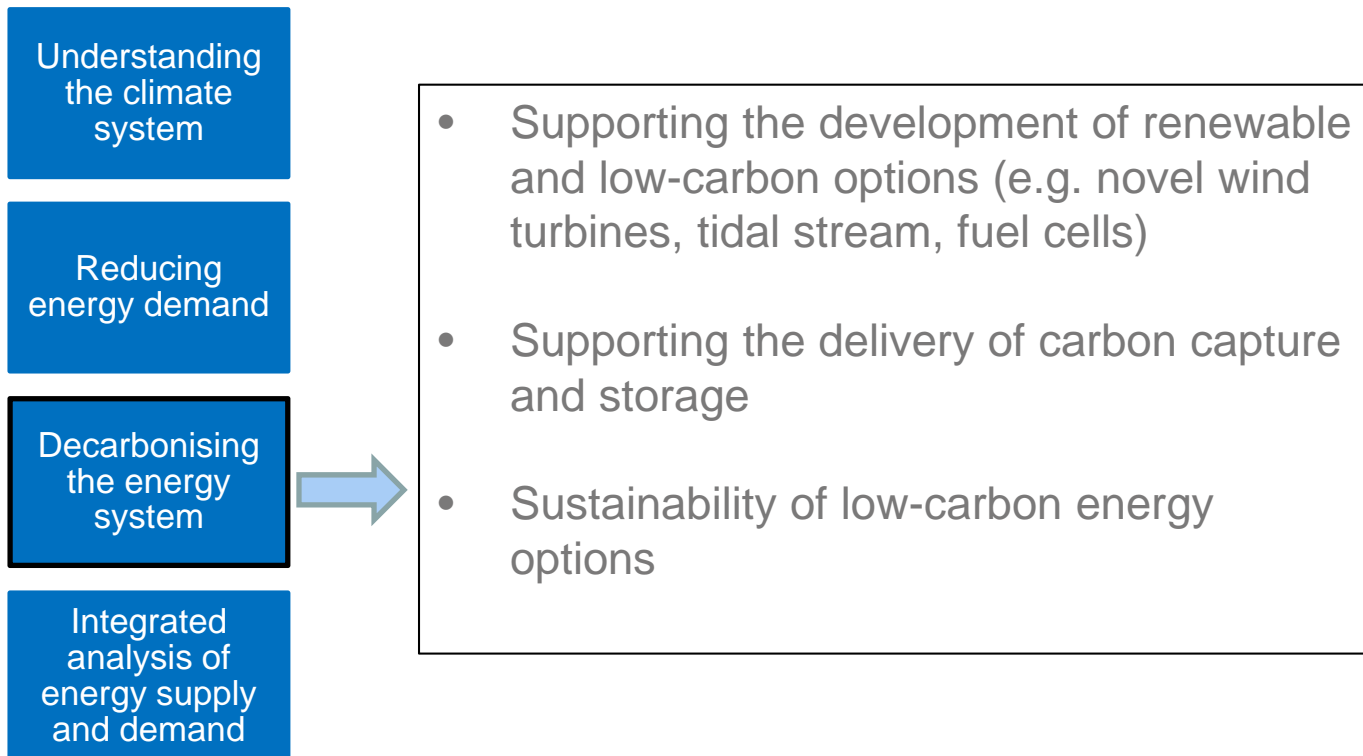


# Reducing energy demand

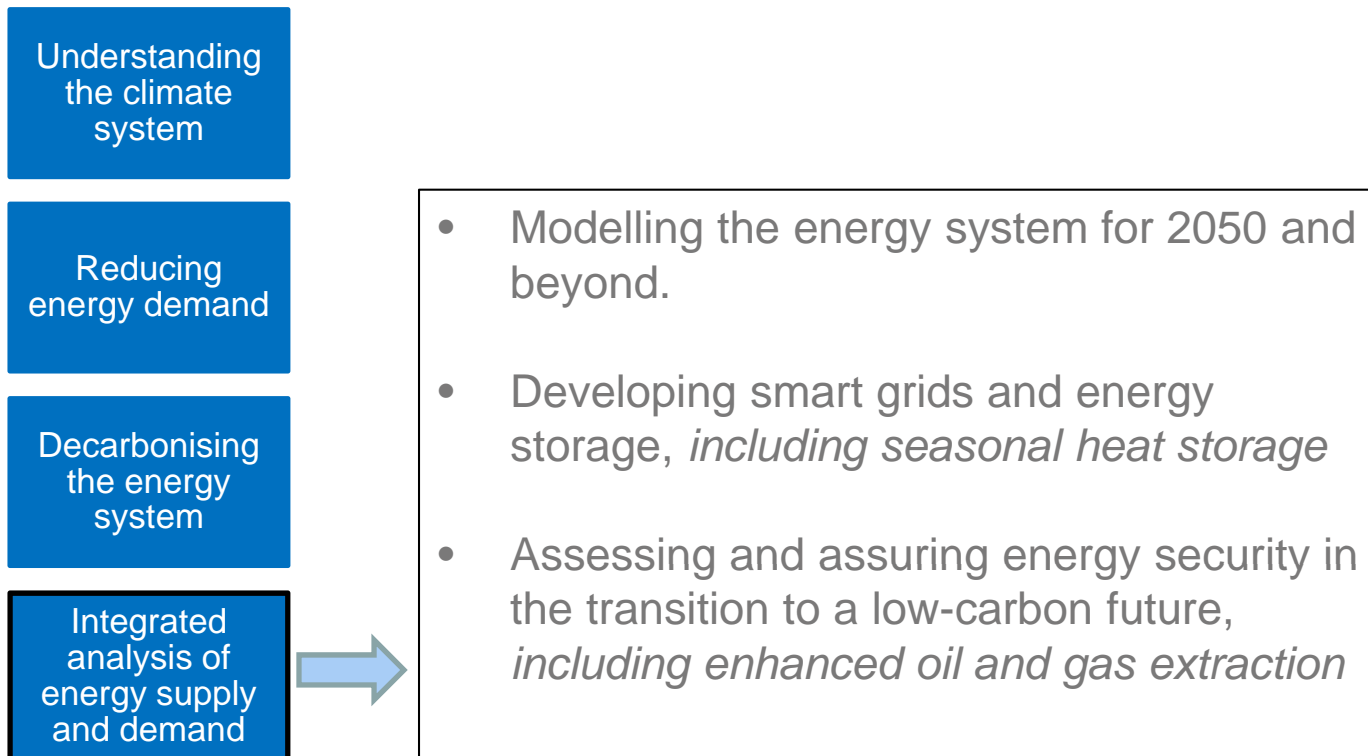




# Decarbonising the energy system



# Integrated analysis of supply and demand



# On 27 July we published the '2050 Calculator' as well as an initial pathways analysis



1

## The 2050 Pathways Calculator:

- The Calculator exists in two forms:
- a. a simplified interactive web tool
  - b. a detailed Excel spreadsheet

2

## The 2050 Pathways Analysis report: call for evidence

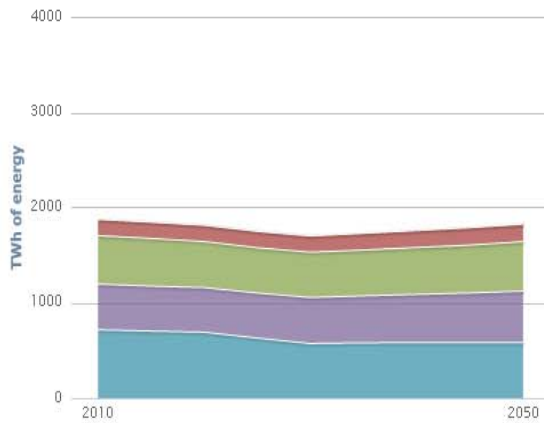
This sets out the analytical approach, a series of illustrative pathways, and some commonalities and uncertainties identified by the pathways. It also sets out for each sector the detailed input assumptions and methodologies.

# 1.a The 2050 Pathways Calculator - simplified interactive web tool



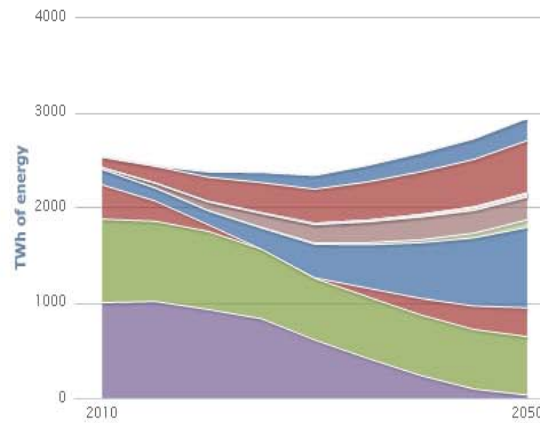
HELP r a b c d e f This tool uses the assumptions in the DECC 2050 Calculator-1.0.7-20July2010. Help us to improve it. SHARE

### UK demand for energy

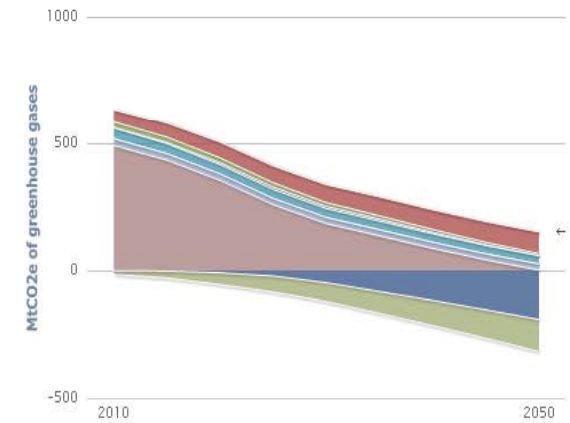


### UK supply of primary energy

[Switch to chart showing just electricity](#)



### Net UK Greenhouse gas emissions



Demand measures:	1	2	3	4
Average temperature of homes	1	2	3	4
Home insulation	1	2	3	4
Home heating electrification	A	B	C	D
Home heating that isn't electric	A	B	C	D
Commercial heat / cooling demand	1	2	3	4
Commercial heating electrification	A	B	C	D
Commercial heating that isn't electric	A	B	C	D
Home light & appliance demand	1	2	3	4
Home light & appliance technology	A	B	C	D
Commercial light & appliance demand	1	2	3	4
Commercial light & appliance technology	A	B	C	D
Industrial processes	A	B	C	D
Individual transport behaviour	1	2	3	4
Electrification of individual transport	1	2	3	4
Domestic freight	1	2	3	4
International aviation	1	2	3	4
International shipping	1	2	3	4

Supply measures:	1	2	3	4
Combustion + CCS	1	2	3	4
Nuclear power	1	2	3	4
Onshore wind	1	2	3	4
Offshore wind	1	2	3	4
Hydroelectric	1	2	3	4
Marine	1	2	3	4
Geothermal	1	2	3	4
Distributed solar PV	1	2	3	4
Distributed solar thermal	1	2	3	4
Micro wind	1	2	3	4
The type of fuels from biomass	A	B	C	D
Quantity of bioenergy imported	1	2	3	4
The way we use our land	A	B	C	D
Waste arising	A	B	C	D
Marine algae	1	2	3	4
Electricity imports / exports	1	2	3	4
Storage, demand shifting, backup	1	2	3	4

Geosequestration	1	2	3	4
Geosequestration	1	2	3	4

#### Some of the consequences of this pathway

2020 emissions	33% below 1990 levels
2030 emissions	55% below 1990 levels
2050 emissions	80% below 1990 levels
2020 electricity	328 gCO <sub>2</sub> M/Wh
2030 electricity	148 gCO <sub>2</sub> M/Wh
2050 electricity	28 gCO <sub>2</sub> M/Wh
2020 energy imports	35% of primary energy
2050 energy imports	25% of primary energy
2050 5 still winter days and	100% of electricity reserves used
Difficulty	2 °Cw of standby generation required 74 Lowest: 35. Highest: 140

# 1.b The 2050 Pathways Calculator - detailed Excel spreadsheet



**MAKE SELECTIONS BELOW:** [Click here for example pathways](#) [Click here for descriptions of each level or trajectory](#)

Trajectory selection	Level	Trajectory
<b>Energy generation</b>	<b>1 2 3 4</b>	<b>A B C D</b>
Ib Combustion + CCS	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
II.a Nuclear power	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
III.a.1 Onshore wind	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
III.a.2 Offshore wind	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
III.b Hydroelectric	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
III.c Wave and Tidal	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
III.d Geothermal	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
IV.a Distributed solar PV	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
IV.b Distributed solar thermal	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
IV.c Micro wind	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
V.a Biomatter to fuel conversion	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
V.b Bioenergy imports	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
VI.a Agriculture and land use	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
VI.b Waste arising	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
VI.c Marine algae	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
VII.a Electricity imports / exports	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
VII.c Storage, demand shifting, backup	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
<b>Demand</b>	<b>1 2 3 4</b>	<b>A B C D</b>
IX.a Domestic space heating and hot water		
(i) Heating / cooling comfort level	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
(ii) Housing thermal efficiency	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
(iii) Electrification level	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
(iv) Non-electric fuel direction	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
IX.c Commercial heating and cooling		
(i) Heat / cooling demand	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
(ii) Electrification level	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
(iii) Non-electric fuel direction	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
X.a Domestic lighting, appliances, and cooking		
(i) Demand / Efficiency	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
(ii) Technology pathway	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
X.b Commercial lighting, appliances, and catering		
(i) Demand / Efficiency	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
(ii) Technology pathway	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
XI.a Industrial processes		
(i) Behavior	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
(ii) Electrification	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
XII.b Domestic freight	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
XIII.c International aviation	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
XIII.e International shipping (maritime bunkers)	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	
XIV.a Geosequestration	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	

**Energy supply and demand**

**Electricity generation**

**Emissions**

NB: Modelled emissions adjusted to match 2007 actuals. See note below emission table.

**Modelled emissions, net of capture, by sector (Mt CO<sub>2</sub>e)**

Sector	2007	2050	% of base yr
I Hydrocarbon fuel power generation	189	182	24%
V Bioenergy	(9)	(45)	(6%)
XIV Geosequestration	-	-	-
VI Agriculture and waste	66	71	9%
IX Heating	84	125	16%
X Lighting and appliances	3	3	0%
XI Industry	93	97	13%
XII Transport	180	179	24%
XV Fossil fuel production	34	16	2%
XVI Transfers	4	8	1%
<b>Total</b>	<b>646</b>	<b>635</b>	<b>84%</b>
% of actual			95%

NB: Emissions (in blue) are modelled from energy consumption and may not agree precisely with 2007 actuals. However, % of base year figures (in black) have been adjusted by a constant factor so that 2007 modelled emissions match 2007 actual emissions.

**Supplemental data**

**Exports and Imports**

Fuel	TWh/year	2007	2020	2030	2050
Y.04 Coal exports (imports)	(277)	(4)	133	177	
Y.05 Oil and petroleum products export	101	(328)	(464)	(653)	
Y.06 Gas exports (imports)	(163)	(844)	(1,196)	(1,678)	
Y.01 Biomatter exports (imports)	(4)	(3)	(2)	-	
Y.02 Electricity exports (imports)	(5)	0	0	(0)	

**Bioenergy contextual data**

Source / Use	TWh/year	2007	2020	2030	2050
<b>Consumption of gaseous hydrocar</b>	<b>1,019</b>	<b>1,278</b>	<b>1,487</b>	<b>1,815</b>	
V Supplied from biogas		2%	3%	4%	3%
IX.a Used in domestic heating		32%	31%	30%	29%
IX.c Used in commercial heating		8%	7%	7%	8%
<b>Consumption of liquid hydrocarbor</b>	<b>880</b>	<b>865</b>	<b>816</b>	<b>841</b>	
V Supplied from liquid biofuels		0%	1%	2%	6%
XIII Used in transport		80%	82%	82%	83%
XI Used in industry		9%	10%	11%	11%
XV.a Used in refineries		6%	6%	5%	5%
<b>Consumption of solid hydrocarbor</b>	<b>443</b>	<b>229</b>	<b>113</b>	<b>114</b>	
V Supplied from solid bioenergy		4%	15%	39%	60%
Ib Used in CCS power plants		-	12%	25%	24%
Ia Used in unabated power plants		84%	59%	18%	18%
XI Used in industry		12%	25%	51%	55%
IX Used in heating		3%	4%	5%	2%

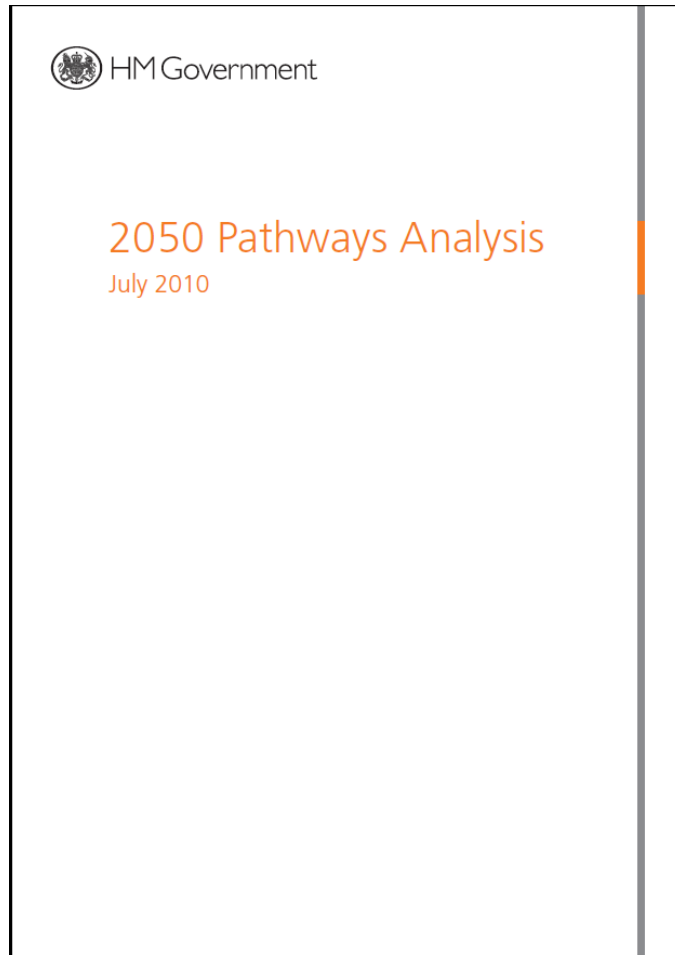
**Energy security contextual data**  
In the event of a 5 day peak in heating and drop in wind

	2007	2020	2030	2050	
Balancing capacity used	%	37%	63%	59%	31%
Extra standby capacity required	GW/cap	-	-	-	-
Probable annual emissions	MtCO <sub>2</sub>	-	-	-	-

**NOW PRESS F9**

Ready | Contents | Instructions | Control | Glossary | Preferences | CHANGELOG | Intermediate output | Conversions | Global assumptions | Constants | Combustion Emissions f | 55%

# The 2050 Pathways Analysis report



## Part 1: Introduction and overview

- Background and approach to 2050 analysis
- Illustrative pathways
- Call for evidence questions

## Part 2: Detailed sectoral trajectories

- Lighting and appliances
- Transport
- Industry
- Space heating, hot water and cooling
- Agriculture and land use
- Bioenergy and waste
- Nuclear
- Fossil fuel Carbon Capture and Storage
- Onshore wind
- Offshore wind
- Tidal range
- Wave energy and tidal stream
- Microgeneration of electricity
- Geothermal electricity generation
- Hydropower
- Electricity balancing
- Negative emissions
- Electricity imports

# Finally...



Science, technology and innovation are at the heart of this transition to a low-carbon future

- We need:
  - **Informed decision making** (e.g. what is the climate actually doing? How might it react to our future actions? What level of energy does the UK demand and when?)
  - **New and innovative solutions** (e.g. How can we use our energy resources more effectively & efficiently? How can we use technology to lower the levels of GHGs in the atmosphere? How might we change behaviour to encourage low carbon living?)
- These challenges must be approached in collaboration with academia, industry and local communities.