



Government
Office for
Science

What next after Copenhagen? Foundation for Science and Technology

Professor John Beddington
Chief Scientific Adviser to HM Government and
Head of the Government Office for Science

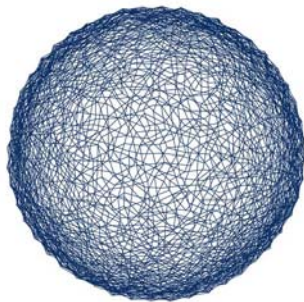
2 June 2010

The Royal Society
London



Government
Office for
Science

Copenhagen: setting the 2°C target

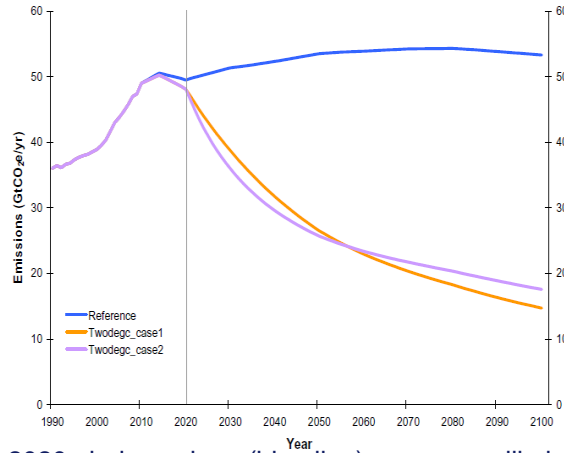


COP15
COPENHAGEN
UN CLIMATE CHANGE CONFERENCE 2009

- The Copenhagen Accord provided a commitment to **limit the increase** in global average temperature to no more than 2°C.
- **More than 70 countries**, accounting for over 80% of global emissions, have submitted emissions reduction targets and actions.



What will the Copenhagen pledges achieve?



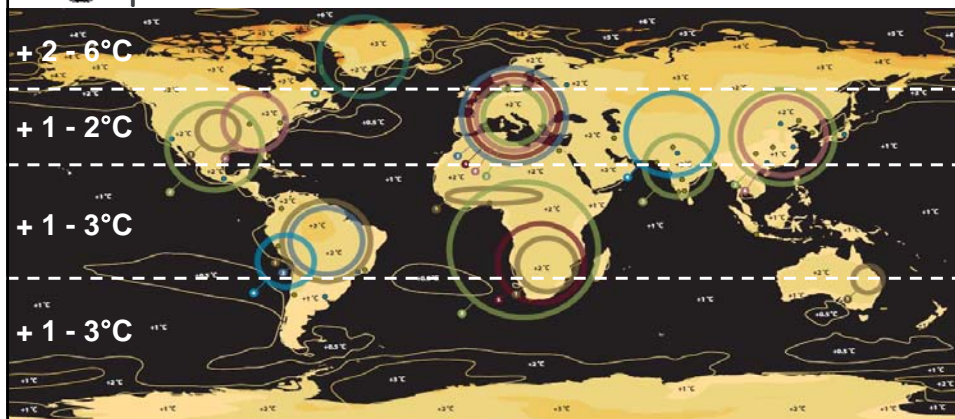
Note, there is significant uncertainty around these scenarios

- The 2020 pledges alone (blue line) are very unlikely to limit global temperature rises to 2°C in 2100
- Significant cuts in global emissions after 2020 will be required (pink and orange lines)

Source: AVOID, Technical Note, 2010



Global temperature rise: the world with a 2°C rise



- Danger of forest fires
- Some cereal crops may increase in mid to high latitudes
- Rising temperatures will cause changes in rainfall patterns
- Glacier melt

- Drought events may become one and a half times as frequent across southern Africa and Mediterranean basin
- Hottest days: China could be 4°C warmer; N. America 8°C warmer; Europe 6°C warmer.
- Global average sea level rise by approx 40cm.

Source: Met Office



Government
Office for
Science

A possible world with a 4°C rise



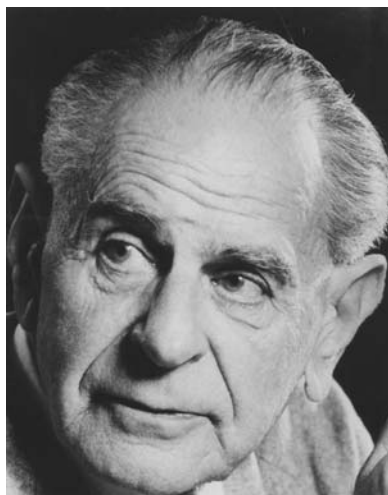
- Increased danger of forest fires
- Crop yields decrease
- Up to 70% reduction in water run-off.
- Sea levels could rise as much as 80cm by the end of the century
- Extreme glacier melt
- Drought events could be twice as frequent.
- Decline of ice sheets
- Tropical cyclones more intense.
- Hottest days: China could be 6°C warmer; North America 11°C warmer; Europe 8°C warmer.

Source: Met Office



Government
Office for
Science

Constructive scepticism is essential for good science



Karl Popper, 1902-1994

“we can learn through criticism of our mistakes and errors, especially through criticism by others”



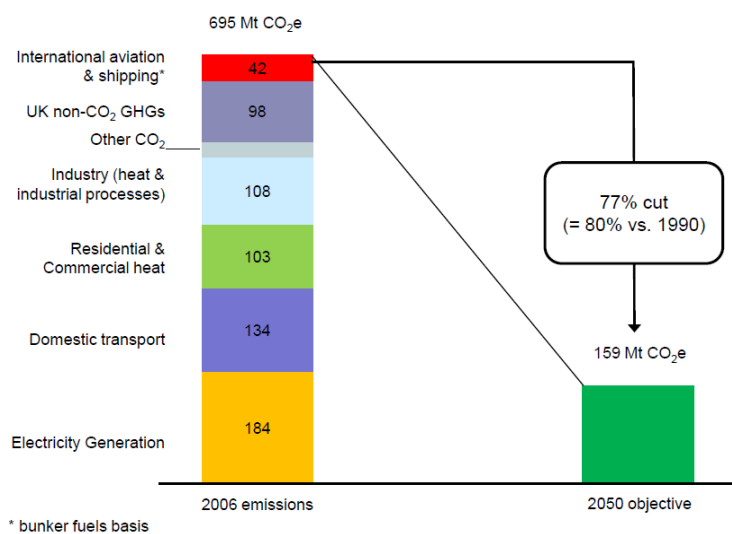
The UK Commitment

The Climate Change Committee has made a number of recommendations which have been taken forward in legislation:

- *The UK should reduce emissions of greenhouse gases by at least **80% by 2050**, as a fair contribution to a global action on climate change*
- *The UK should reduce emissions of greenhouse gases by **34% by 2020***
- *Once a global deal is reached, the target should increase to **42% by 2020***



Scale of the 80% reduction challenge



Source: CCC's report 'Building a low carbon economy'



Government Office for Science

A fundamental shift is required in the way energy is produced and consumed

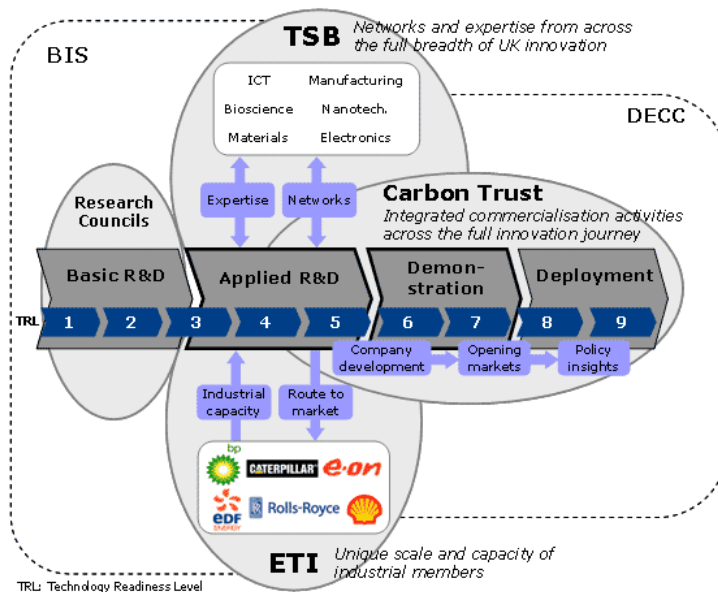
Analysis by DECC indicates that meeting the 2050 target will require:

- Ambitious **energy demand reduction**
- A substantial level of **electrification** of heating and surface transport
- Electricity supply needs to be largely **decarbonised** by the 2030s, and may need to double
- Sustainable **bioenergy** is an important, but limited, part of a low-carbon energy system
- **Reduction in emissions** from agriculture, waste, industrial processes and international transport will be necessary by 2050



Government Office for Science

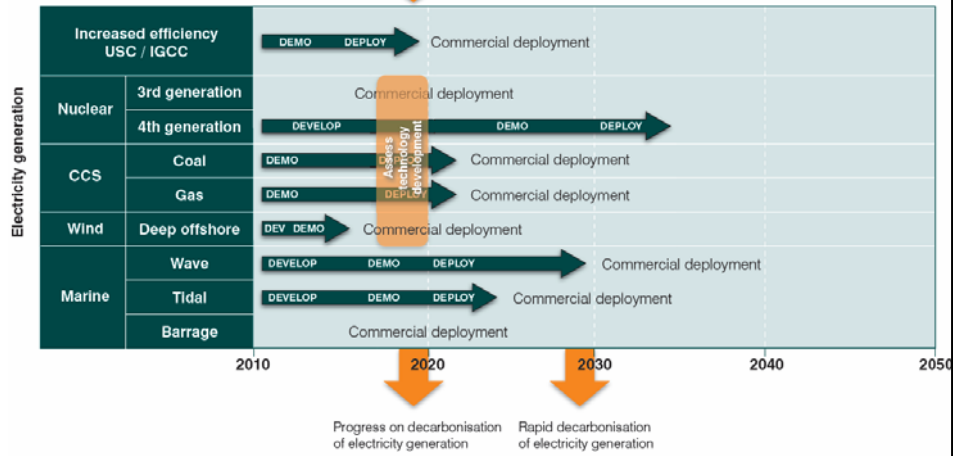
The UK Low Carbon Innovation Group





Electricity generation: Technology innovation timeline

Progress of demand-side and enabling technologies to deliver affordable flexibility for system operation



Energy Research Partnership, Energy Innovation Milestones to 2050



Key Technology Areas: Offshore Wind

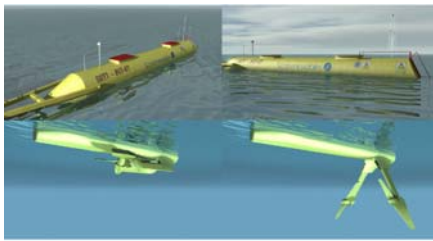
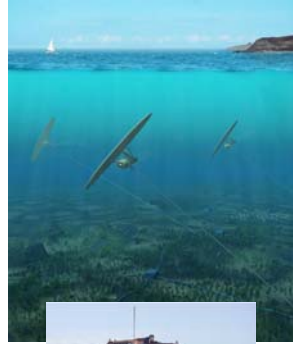


Source: The London Array www.londonarray.com



Government
Office for
Science

Key Technology Areas: Marine



AWS full-scale pilot plant during submergence offshore Portugal, May 2004

Figure 1.1: SRTT Transport and Operation Configurations



Government
Office for
Science

Next generation biofuels

Next generation biofuels offer potential e.g. from appropriate wastes, residues and other technologies



Biofuels could be derived from grassy plants like miscanthus



Seabiotic Algae Plant, Israel

Algae Biofuels Challenge

Source: Carbon Trust



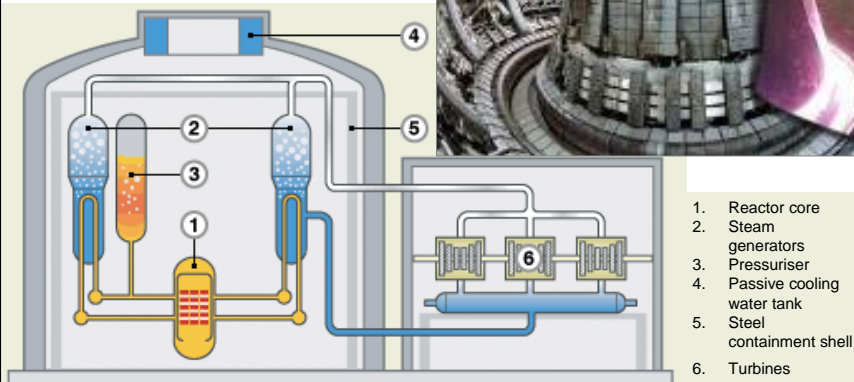
Government Office for Science

Key Technology Areas: Nuclear

Fusion at JET (Joint European Torus) in Oxfordshire, UK



Generation III Nuclear



1. Reactor core
2. Steam generators
3. Pressuriser
4. Passive cooling water tank
5. Steel containment shell
6. Turbines

Source: Westinghouse AP1000



Government Office for Science

We will need to adapt as well as mitigate

Providing the evidence
 - UK Climate Change Risk Assessment to be produced every 5 years – the first due by Jan 2012. Required by CCA

The 2008 **Climate Change Act (CCA)** set out the requirement for a national **Climate Change Risk Assessment** to take place every five years, and for a **national adaptation programme** to be put in place

The Adapting to Climate Change Programme

Taking action
 - March 2010, all central Government Departments published **adaptation plans**, alongside plans for reducing emissions
 - National Programme to address the risks identified in the Risk Assessment must be presented to Parliament in 2012

Raising Awareness
 - CCA provided a power to require providers of public services to report on risks from climate change and plans to address them. First reports due this year. 90 organisations being asked to report including electricity providers, water companies and Port Authorities.
 - All local authorities are also reporting on their risks.

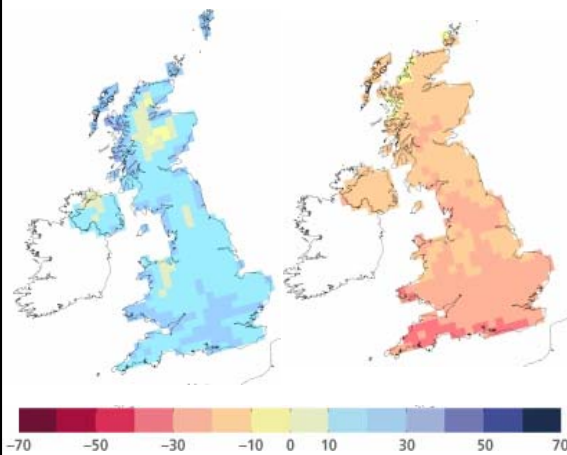
Government's work is scrutinised by the **Adaptation Sub-Committee**, chaired by Lord Krebs. Reports to Parliament under Climate Change Act.



Changes in mean precipitation
in 2080, 50% probability estimate

Winter

Summer



Adapting to
climate change

UK Climate Projections

June 2009



Building
Britain's Future

ACT ON
CO₂

defra
Department for Environment,
Food and Rural Affairs



Three key messages

- If the countries in the Copenhagen Accord fulfil their pledges we might be able to **prevent the average global temperature from rising by more than 2°C**, but only if there are major reductions in greenhouse gas emissions post 2020
- The UK faces an **enormous challenge** to meet our commitments to reduce greenhouse gas emissions: 34% by 2020, 80% by 2050
- It is essential that we **plan properly** to address the risks involved in adapting to climate change