

UK Energy Research Centre

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01/04/09, LCS-RNet, Trieste

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UK ENERGY POLICY GOALS

- 80% reduction of CO₂ emissions by 2050
- ≥26% reduction of CO₂ emissions by 2020
- Renewables to supply 15% of UK energy by 2020 (currently ≈2%)
- 5% of road transport to be biofuel by 2010
- Maintain reliability of energy supplies
- Promote competitive markets
- Ensure every home is adequately heated

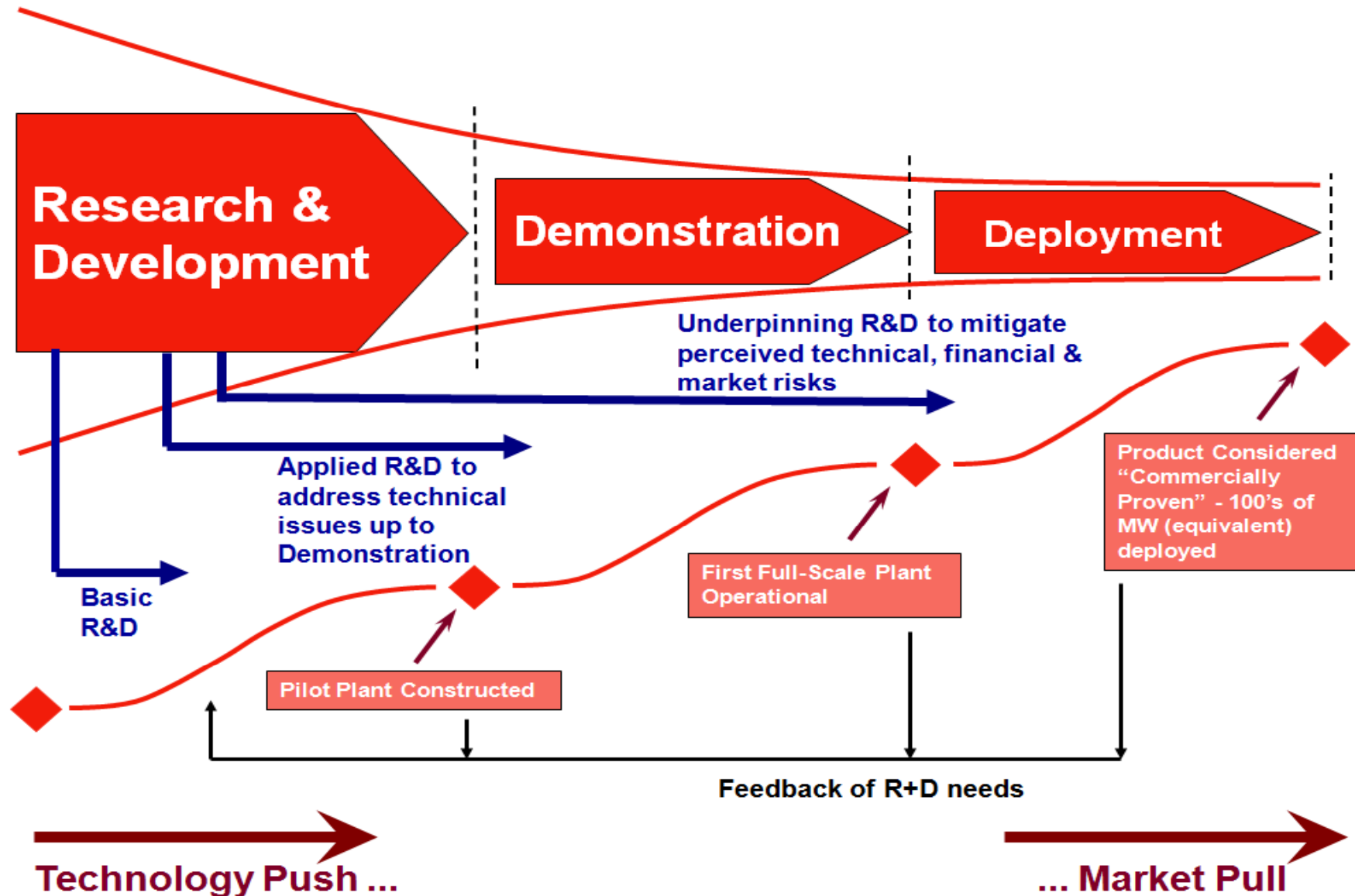
Meeting these targets will require a transformation of energy production, distribution and consumption

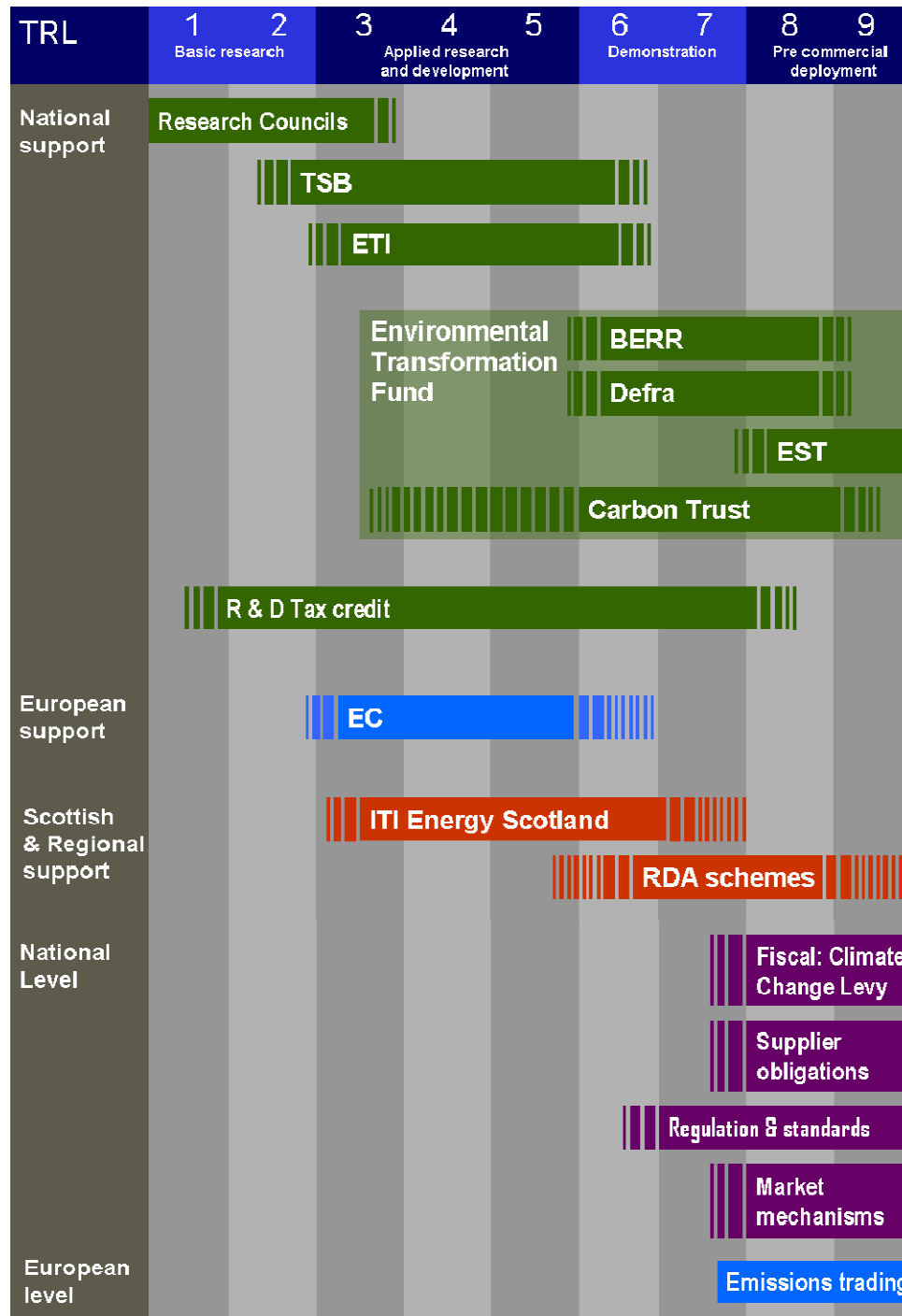


Energy Act 2008
Climate Change Act 2008

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The 'ideal' energy innovation process





Support for technologies in the UK

public investment on RDD&D
c.£200m p.a.

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UK Research Councils' Energy Programme



- >£90m pa
- UKERC
- SUPERGEN (Sustainable Power Generation)
 - Technology-specific large research programmes
- Carbon Vision Programme (mainly buildings)
- Fusion Programme
- Research Training and Capacity Building
- Many other 'responsive mode' activities

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UKERC's mission

- *UKERC's role is to undertake a programme of whole systems energy research and promote cohesion within the overall UK energy research effort.*
- The centrepiece of the UK Research Councils' Energy Programme
- A world class centre for interdisciplinary whole systems energy research (70+ researchers at 18 Universities)
- A bridge between the UK energy research community and the wider world of business, policy and international energy research
 - Research Atlas (landscape, roadmaps, research register)
 - Energy Data Centre
 - National Energy Research Network (500 members)
 - Meeting Place (15-20 events per annum)
 - Technology and Policy Assessment

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UKERC activities

- Interdisciplinary 'whole systems' energy research programme
 - over 150 peer-reviewed articles and reports to date
 - research presented at most major international energy conferences.
- National Energy Research Network (NERN)
 - information and collaboration opportunities to nearly 500 active national and international energy researchers
 - members include academics, industry, civil servants and policy makers and investors.
- Research Atlas
 - a series of reports on the UK energy research landscape
 - fully searchable research register containing details of all research council energy projects
 - energy data centre: deposit where key datasets are curated
 - detailed roadmaps for specific energy technology areas
- Meeting Place
 - gateway and networking hub linking UK and international energy researchers. Organised and facilitated numerous outcome-focused research events.

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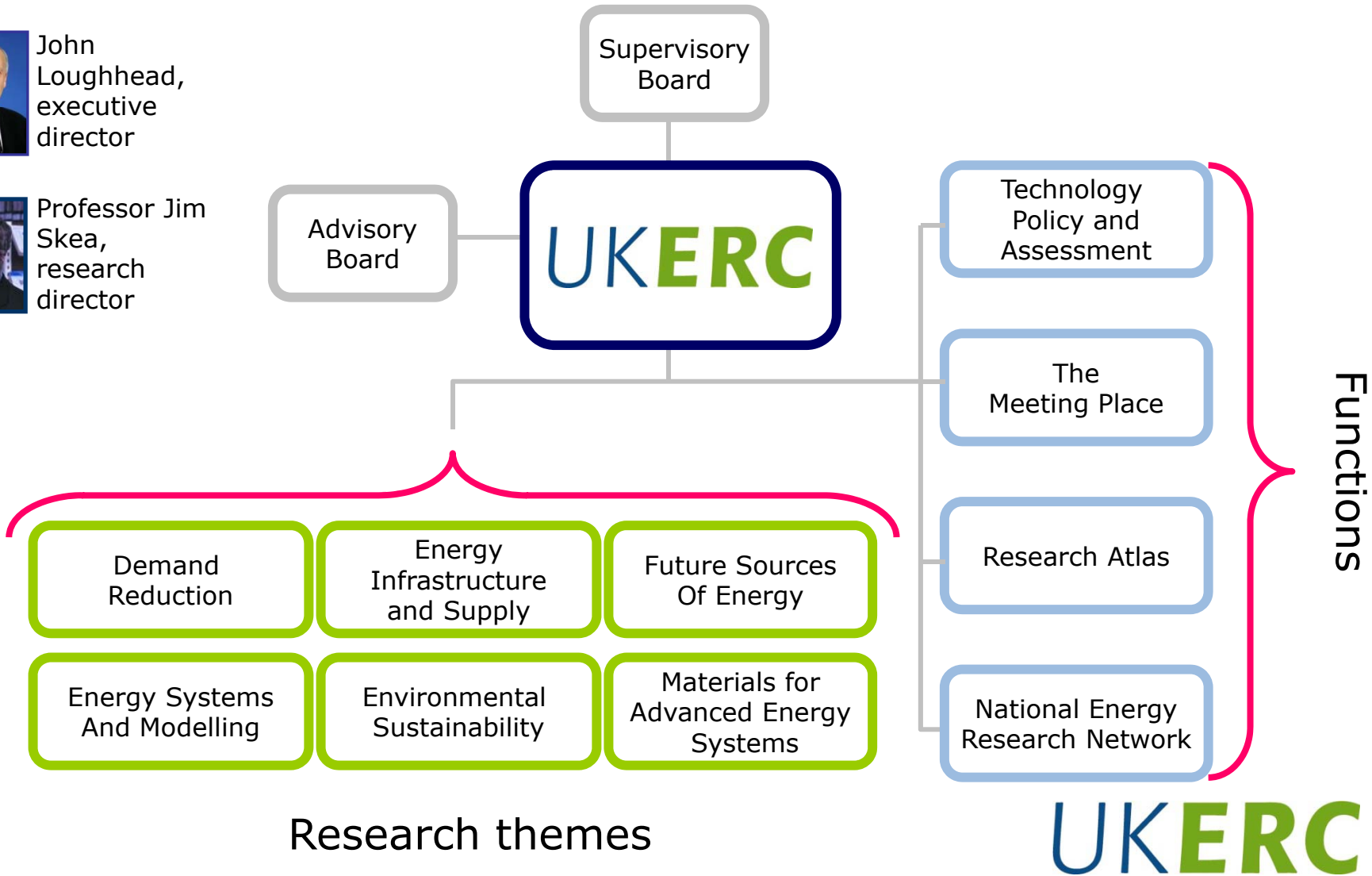
UKERC Structure, Phase I (2004-09)



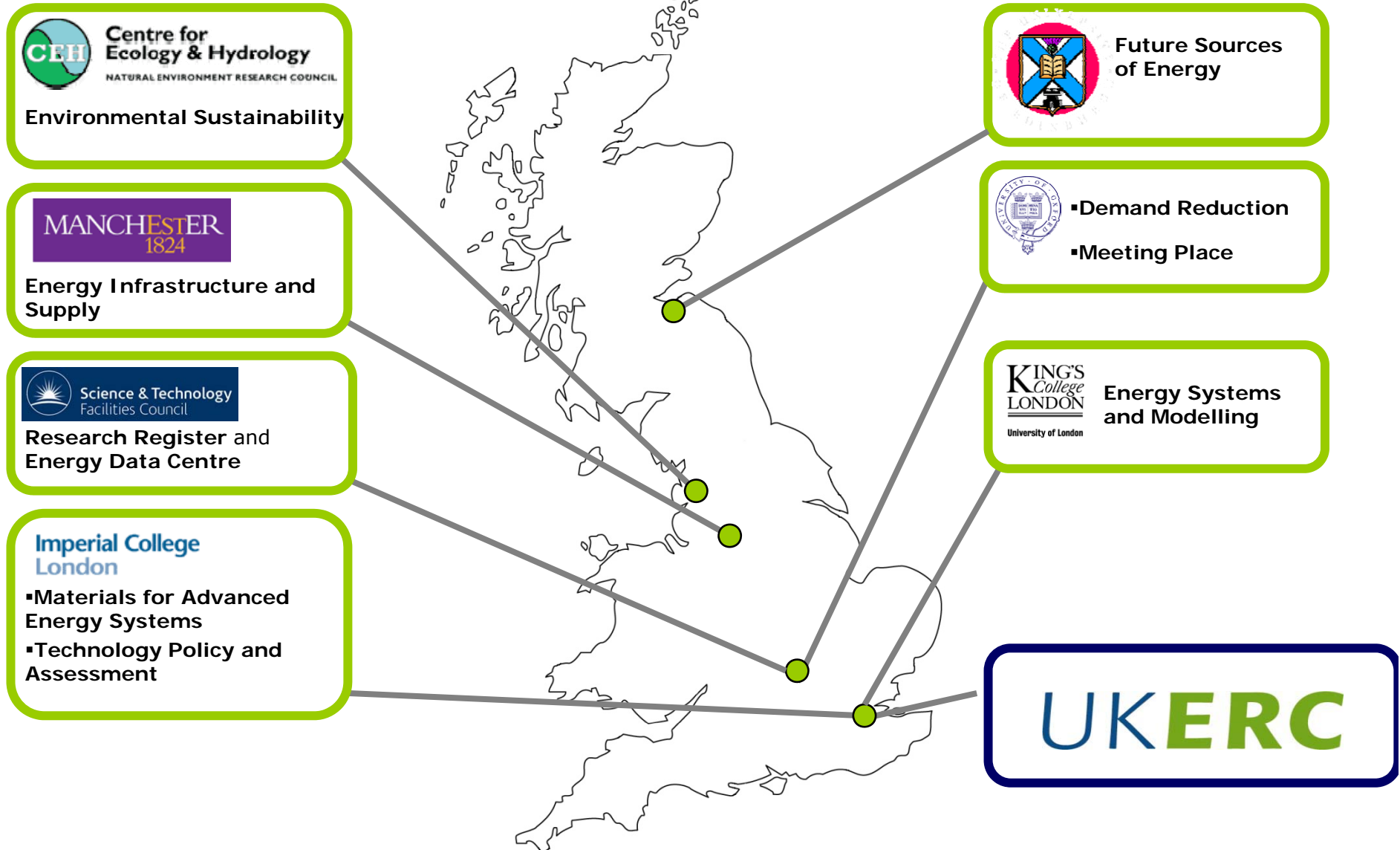
John Loughhead,
executive
director



Professor Jim Skea,
research
director



Where are we?



UKERC Energy 2050 Project

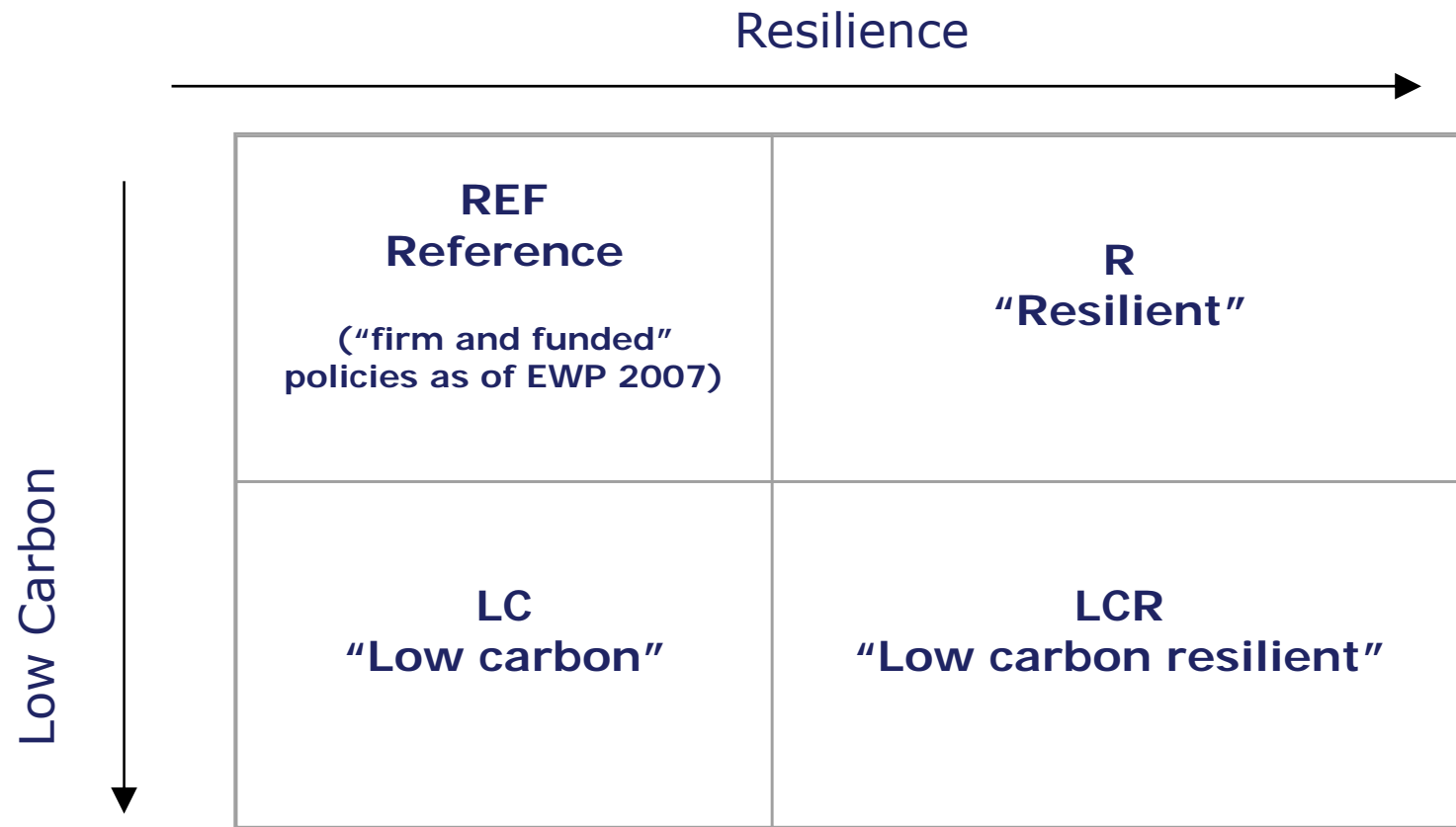
- taking stock mid-way point in Phase I (2006)
- UKERC collectively has the capability to address (if not answer) key questions about long-term energy policy
- Create stronger links between UKERC's different research themes
- Define research problems which can be addressed *only* by collaboration within the Centre
- i.e. creating dependencies between different parts of the Centre

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Methodology

- underpinned by high-level scenarios
- different research themes collaborate in working groups
- making use of a range of system-level, network and sectoral modelling tools (e.g. MARKAL)
- use of detailed insights from the research themes to fill in lack of detail in high-level modelling tools
- “soft-linking” different models

Energy 2050 'Core Scenarios'



UKERC Energy 2050 workstreams

- pathways to a low carbon energy system
- energy security and resilience
- lifestyle and consumption
- socio-environmental sensitivities
- global energy markets
- de-centralised energy systems
- *technology acceleration*
 - Scenarios with accelerated development of renewable energy, CCS, nuclear and fuel cells



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Decarbonising the UK Energy System:

**Accelerated Development of Low Carbon
Energy Supply Technologies**

UKERC Energy 2050 Research Report No. 2

Version 2

March 2009

**Executive Summary
(subject to peer review)**

Mark Winskel, Nils Markusson, Brighid Moran and Henry Jeffrey
(Edinburgh University)

Gabriel Anandarajah and Nick Hughes (Kings College, London),
Chiara Candelise (Imperial College, London), Donna Clarke and Gail
Taylor (Southampton), Hannah Chalmers (Surrey University), Geoff
Dutton (Rutherford Appleton Laboratories), Paul Howarth
(Manchester University), Sophie Jablonski (Imperial College),
Christos Kalyvas (Imperial College, London) and David Ward
(UKAEA Culham)

Technology Acceleration: Key Messages

- Technology acceleration could have a major influence on energy system decarbonisation, especially in the longer term. In attempting to map out decarbonisation pathways, it is important to take this into account.
- The overall impacts of accelerated technology development are complex. Raising the decarbonisation ambition from 60% to 80% does not mean doing 'more of the same' – it introduces new technology preferences and research priorities.
- Technology acceleration could substantially reduce the overall cost of decarbonisation. Between 2010-2050, accelerated development is associated with a total saving in UK 'welfare costs' of decarbonisation of £36bn. Most of this accrues in the longer term, after 2030.

Technology Acceleration: Key Messages

- Because RD&D costs are shared internationally, the overall benefits of accelerated development greatly outweigh the investment costs.
- For the UK, the benefits imply a much greater RD&D investment – much of this needs to be committed well before significant ‘returns’ start appearing after 2030.
- Accelerated development introduces alternative decarbonisation pathways in the longer term, with greater contributions from CCS, fuel cells, and renewables such as offshore wind, marine and solar PV.
- Accelerated development only changes deployment in the longer term. In the shorter term, decarbonisation will require responses from demand reduction, improved efficiency and more mature supply technologies.

Technology Acceleration: Key Messages

- Realising the benefits of technology acceleration requires the UK to participate fully in global efforts at low-carbon technology innovation – this promises big rewards in the longer term.
- There are no simple messages in terms of ‘picking winners’ – the need is for sustained support of a broad portfolio of emerging low-carbon technologies.
- Energy 2050: Key Messages
 - Energy efficiency, especially in existing buildings
 - De-carbonise electricity – but don’t prescribe which technology
 - Support innovation across the entire chain – from basic R&D to deployment
 - Avoid locking into specific pathways too early

UKERC Phase II (2009-2014)

- *To help secure the UK's energy supply, provide energy solutions for the future and dramatically reduce carbon emissions*

Research Councils' Energy Programme award,
March 2009

Climate change is the biggest challenge of our generation ... one of the real strengths of the UK Energy Research Centre is that it brings together scientists from a variety of disciplines, to find solutions faster.

Lord Drayson, Minister for Science and Innovation

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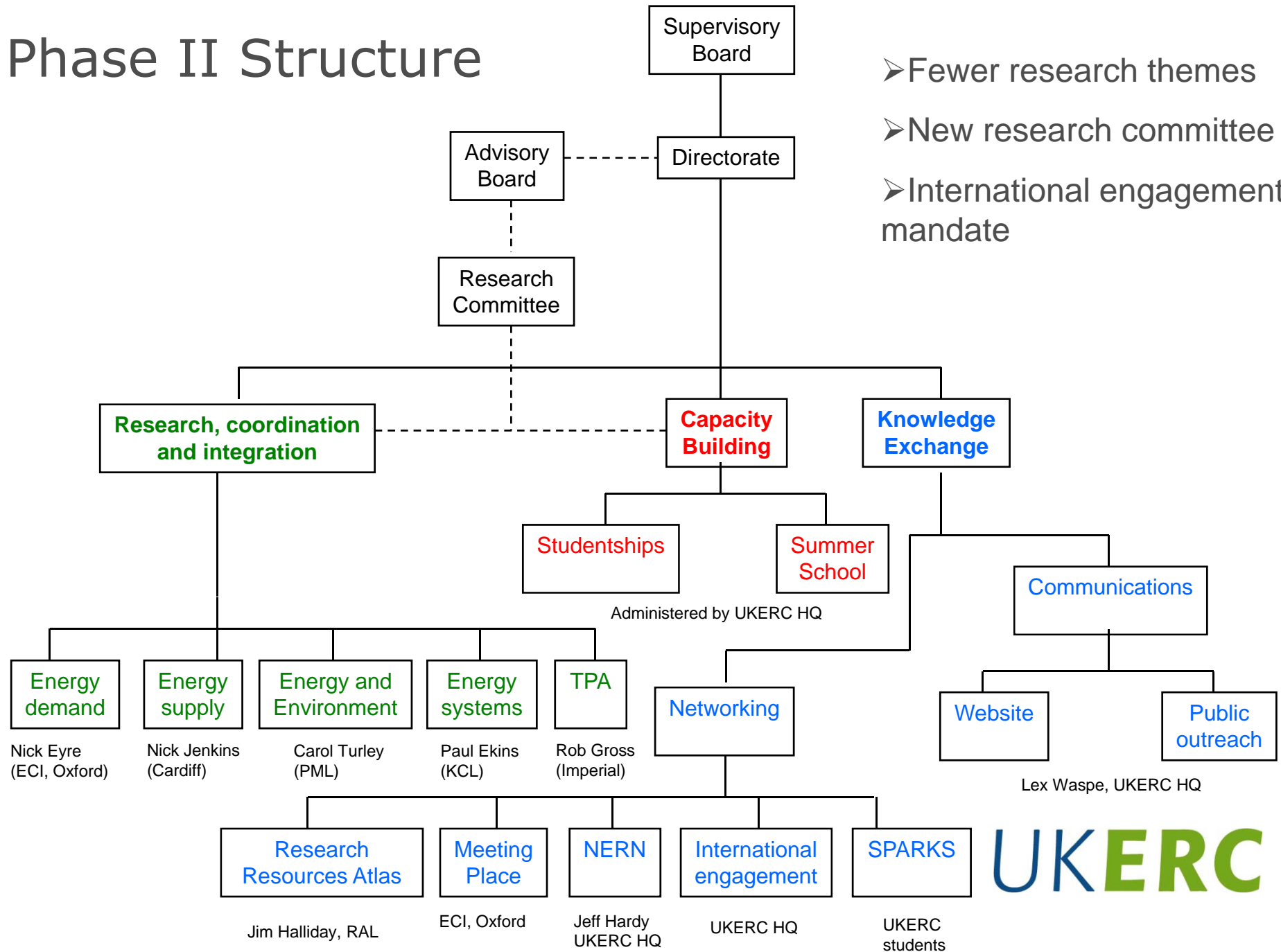
UKERC Phase II: Basic Activity Areas

- Capacity Building (same as Phase I)
- Knowledge Exchange (same as Phase I)
- Research programme (revised from Phase I)
 - 40% of the Research Programme will involve a competitive research fund
 - respond to emerging developments in energy research or policy
 - draw a wider range of researchers into UKERC

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Phase II Structure

- Fewer research themes
- New research committee
- International engagement mandate



Capacity building

- UKERC Interdisciplinary PhD studentships
 - Annual competition for 5-7 PhDs
 - Must be interdisciplinary research
 - Alumni of 30 students
- UKERC Annual Energy Summer School
 - 5-day residential course
 - 100 UK and international research students
 - Now enrolling for 2009, at www.ukerc.ac.uk

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UKERC II: Research Challenges

- Driving systemic change in the energy sector
 - transforming patterns of energy demand
 - new energy vectors or the use of energy storage
 - decarbonisation of the electricity sector
 - accelerating low carbon technology deployment
- Managing environmental impacts
 - global dimensions of UK decision-making
 - consequences for environmental impacts and eco-system services
- Energy security
 - international linkages
 - UK infrastructure
- Developing tools and methods to address the challenges
- Timescale: the bridge between 2020 (short term) and 2050 (long-term)

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UKERC and LCS-RNet

- UKERC can contribute work on modelling low carbon energy systems, understanding the contribution of technological change to low carbon societies, and investigating the role of lifestyle change and behaviour.
- LCS-RNet can allow the sharing of results globally between developed and developing countries, help build capacity to understand what a low carbon society is and how it can be achieved, and provide useful evidence for policy-makers.
- The most important question is how to achieve a low carbon society, and what key steps need to be taken in the next two decades to put us on a trajectory to a low a carbon society.
- In the UK, we believe that an 80% reduction in greenhouse gas emissions by 2050, from a 1990 baseline is a fair contribution to achieving a low carbon society in the global context.

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Thank You

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