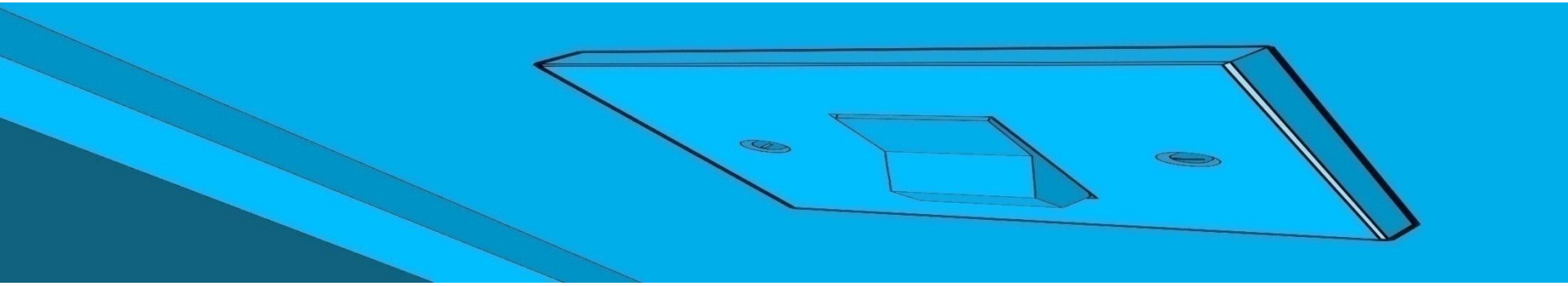

Personal transport in the UK: From pump to plug?

Dr Jeff Hardy

Knowledge Exchange Manager

UKERC

UK Energy Research Centre

What is UKERC?

- The centrepiece of the 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

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Knowledge Transfer Network
Energy Generation & Supply

UK Energy Generation & Supply KTN

“A dynamic network delivering strategic value to the UK energy sector”

by enabling

- accelerated innovation
- access to funding
- partnerships
- international engagement
- cross-sector links
- technology deployment

Knowledge Transfer Network

Energy Generation & Supply

Delivery Structure

Steering Group

Technology Strategy Board – Driving Innovation

nationalgrid – The power of action.

bp, Clipper, EDF Energy, E.ON, Vattenfall, Rolls-Royce, Scottish and Southern Energy, Bac2, SUBSEA UK, EMEC Orkney, Department of Energy & Climate Change, Scottish Enterprise, One North East, WHEB Ventures – Clean Technology Venture Fund, University of Birmingham

KTN Director

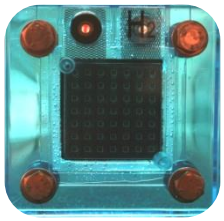
TWI

Delivery Partners

AEA, APG TF, itf, synnogy, UKERC








Led by key industry leaders to meet the industry needs | Delivered by a strong EG&S KTN partnership

UK energy policy

- Low carbon
  - 34% 2020
  - 80% 2050
- Secure
- Affordable
- Promote competitive markets

Energy Act 2008

2008 c. 32

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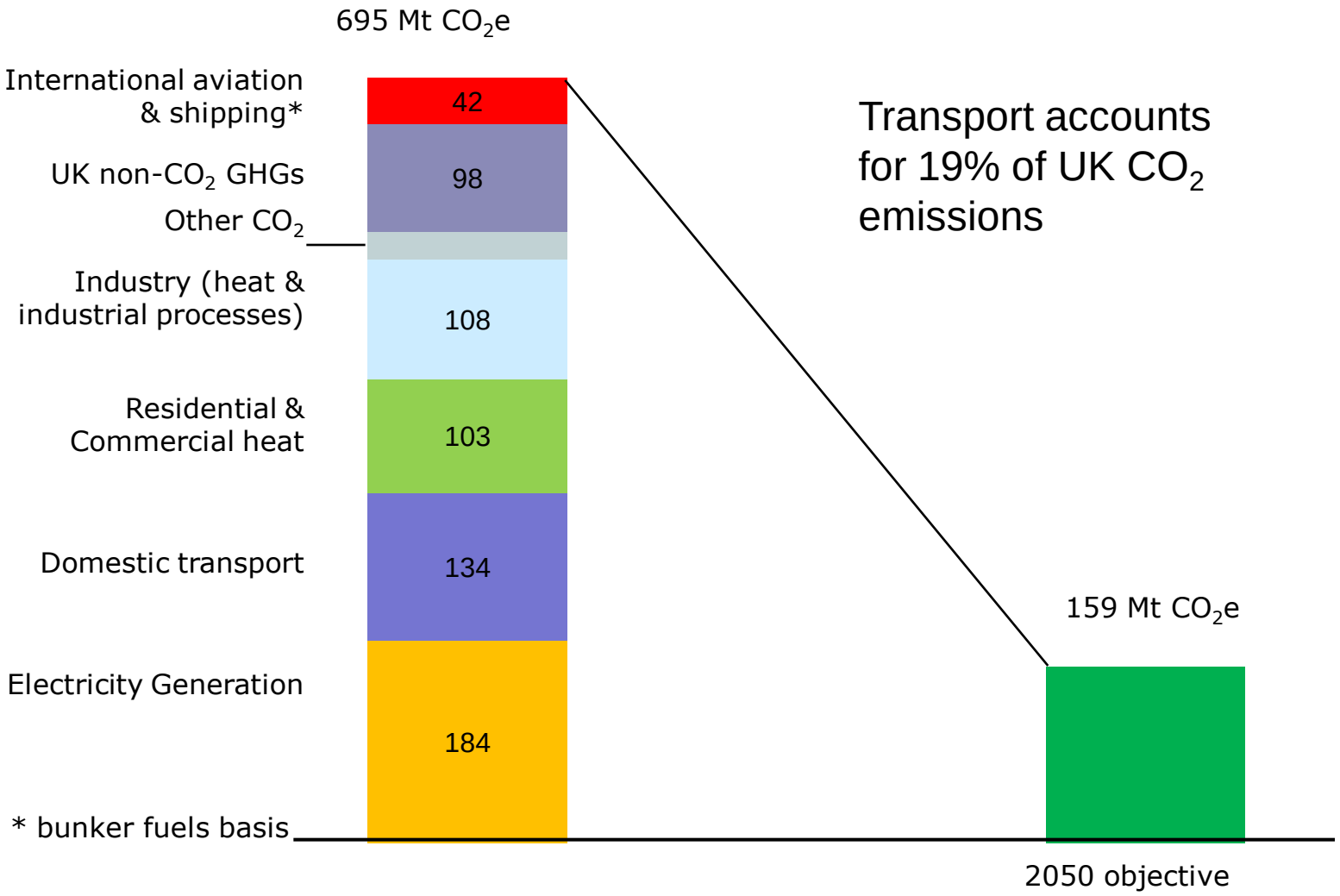
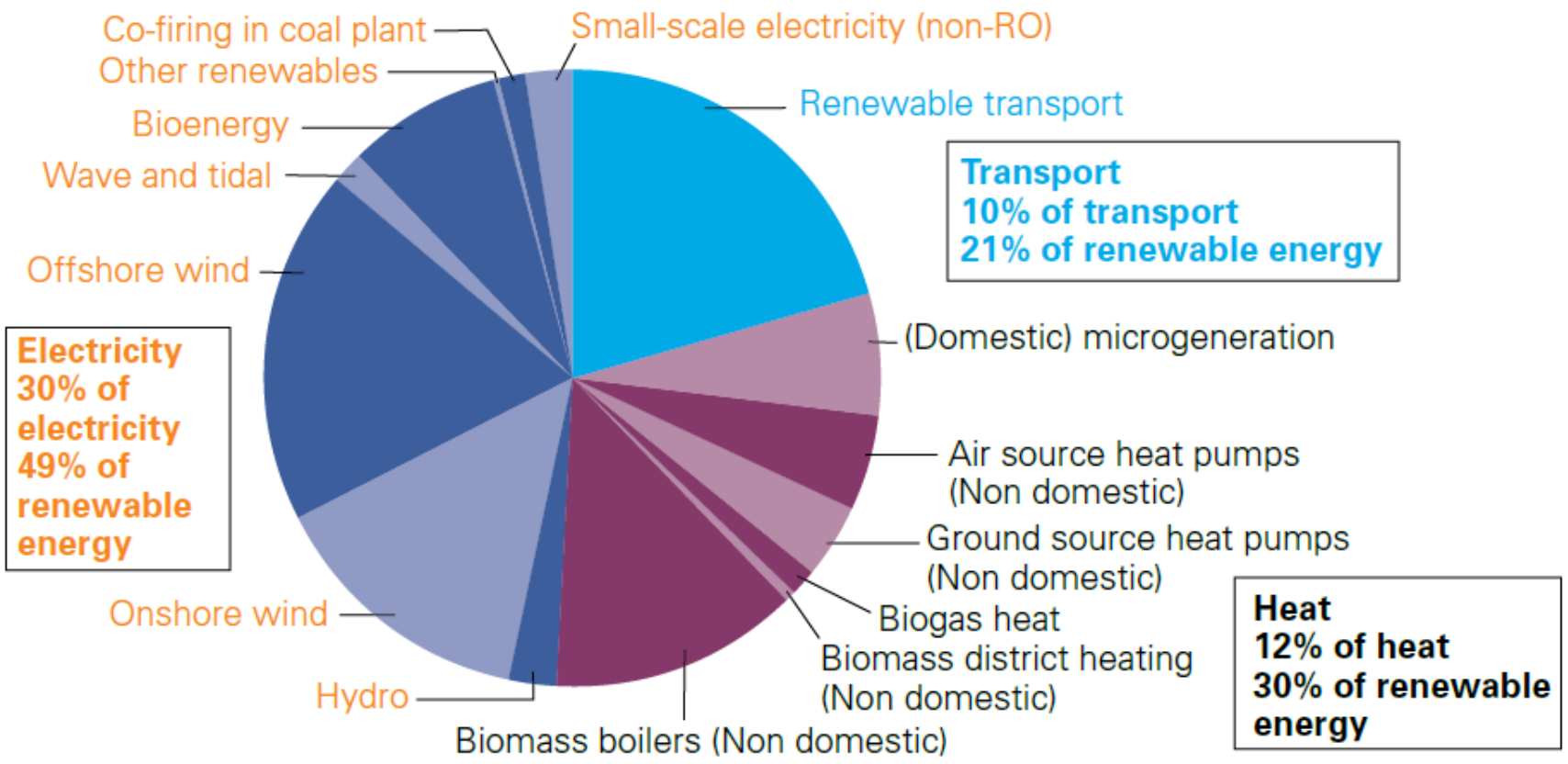
The scale of the UK challenge



Source: Committee on Climate Change

UK Renewable Energy Strategy

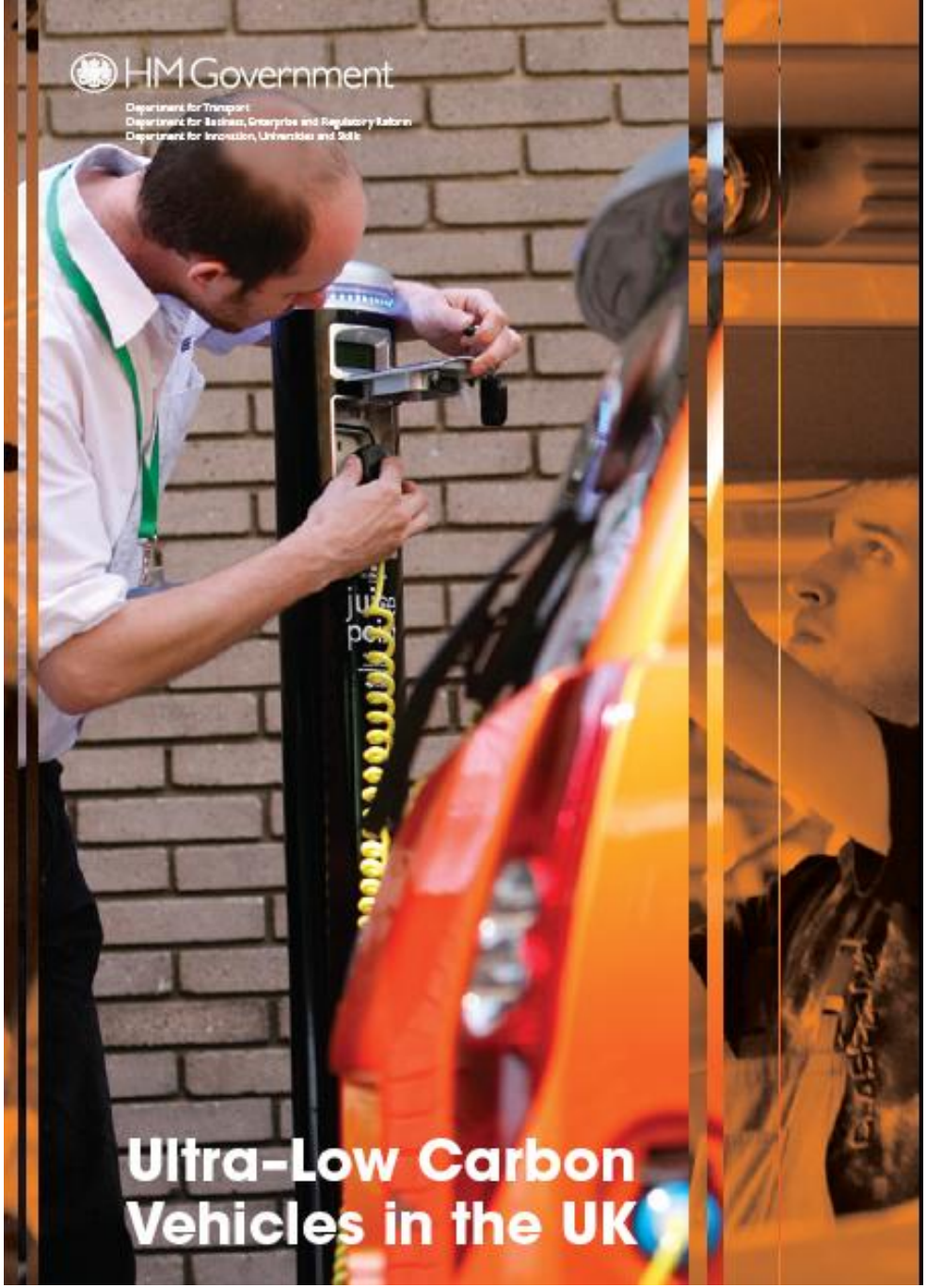
Illustrative mix of technologies in lead scenario, 2020 (TWh)



Source: DECC analysis based on Redpoint/Trilemma (2009), Element/Pöyry (2009) and Nera (2009) and DfT internal analysis

UK EV policy

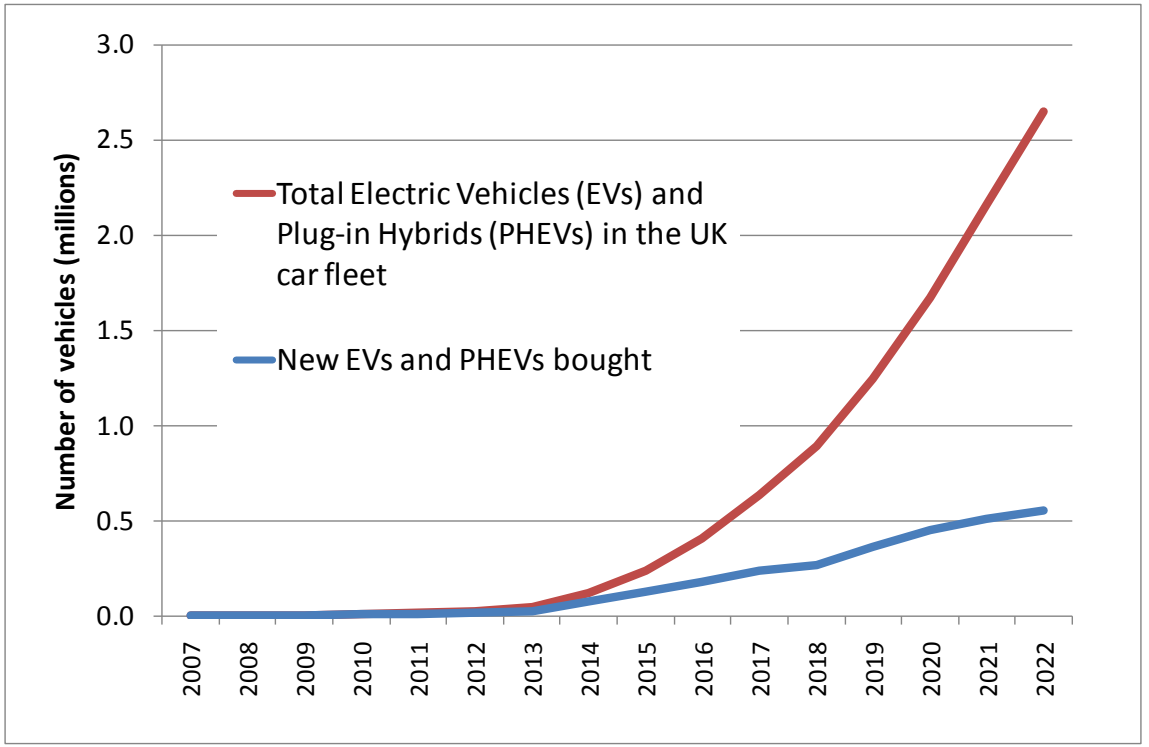
- EU CO_2 emissions target for new vehicles
  - 2020 – 95g/km
- 500 EV demonstrated 2011
- Up to £5K assistance to purchase EV and PIHEV
- £30M package for EV charging points
- Office for Low Emission Vehicles



DfT report- Ultra–Low Carbon Vehicles in the UK

Electric car policies

•Models expected to come to market in next few years.
• Scope for substantial **battery cost reduction**.
• Government has committed price support of £2,000-5,000 per car totalling £230 million; CCC analysis suggests up to £800 million may be required.
•Government support for development of charging infrastructure is required.
• Pilot projects targeting 240,000 cars in 2015, on way to **1.7 million in 2020**.
• Limited impacts on power networks to 2020.



Vital EV ingredients

- Cost and function similar to incumbent technology
- Low-carbon and cheap electricity
- Cheap, long-lasting batteries
- Lightweight vehicles
- Friendly charging infrastructure
- Smart meters

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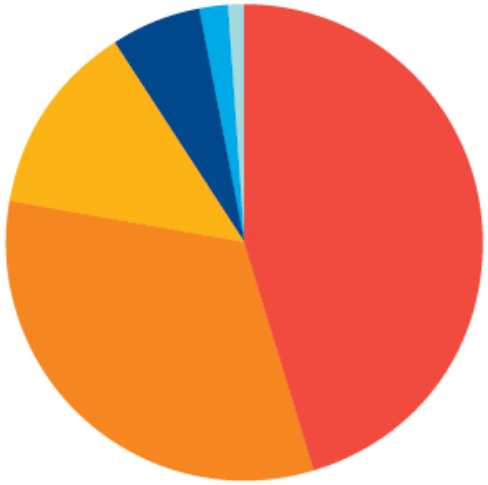
UK electricity

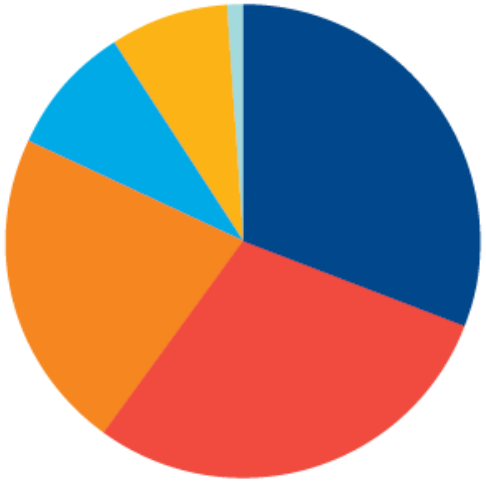
Chart 2

Around 75% of our electricity is currently generated from gas and coal today; renewables will expand to around 30% of our generation by 2020[1]



Today

- Gas 45%
- Coal 32%
- Nuclear 13%
- Renewables 6%
- Other sources 2%
- Oil 1%



2020

- Gas 29%
- Coal 22%
- Nuclear 8%
- Renewables 31%
- Other sources 9%
- Oil 1%

Source: Energy Trends (2009, Quarterly) Department for Business Innovation and Skills (2009)

Source: Department of Energy and Climate Change

Batteries

Batteries

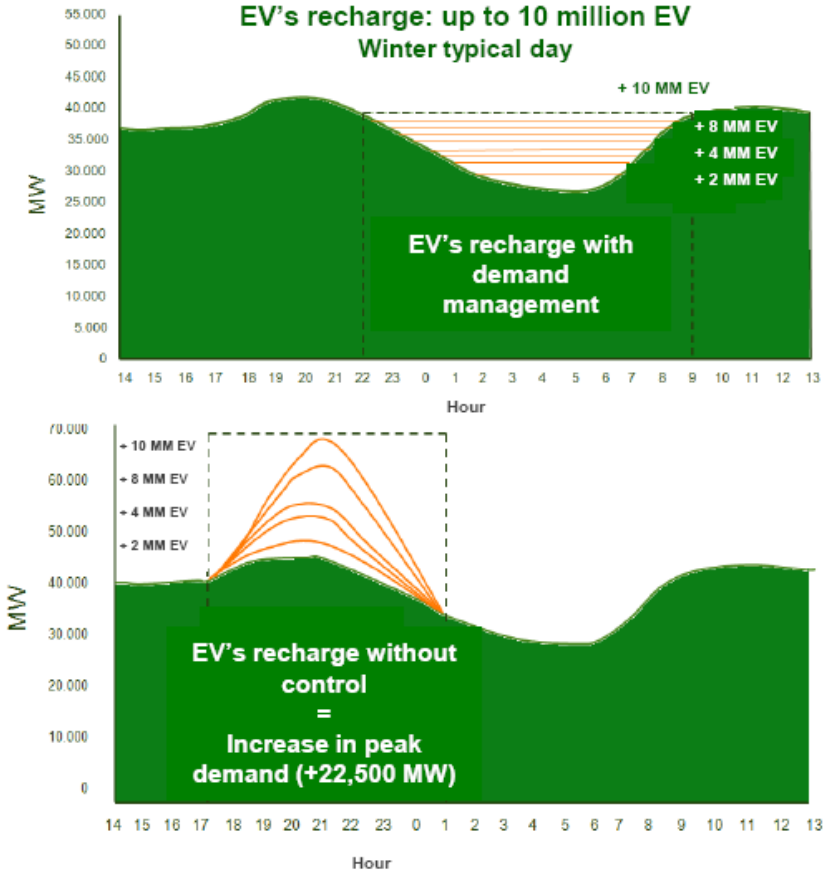
- Higher energy density and lighter batteries
- Recharging cycle and memory effect improvements

	Lead acid	Ni-Cd	Ni-MH	Zinc Air	Sodium sulphide	Zebra NaNiCl	Lithium technology
Power density W/Kg	180	150	250- 1000	80-140	150	150	250-1800
Energy density (Wh/kg)	30-50	45-80	60-120	220	110	100-120	90-300
Recharging time	>10 h	8 h	6 h	na	na	na	< 3 h
Life cycles	300-800	2000	1000	200	1000	> 1000	1200
Cost €/KWh	80	280-500	170	60	na	200	200-1000

Source: Iberdrola (at Energy Storage Workshop, Madrid, 2010)

Charging

A large implementation of EVs could mean a significant electricity peak demand increase…



Peak demand control

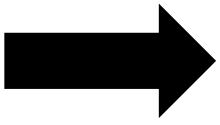
Renewables integration

Slow and nightly charge: *Dominant*

Quick charge: *Occasional*

Source: Iberdrola (at Energy Storage Workshop, Madrid, 2010)

UK Research and Development



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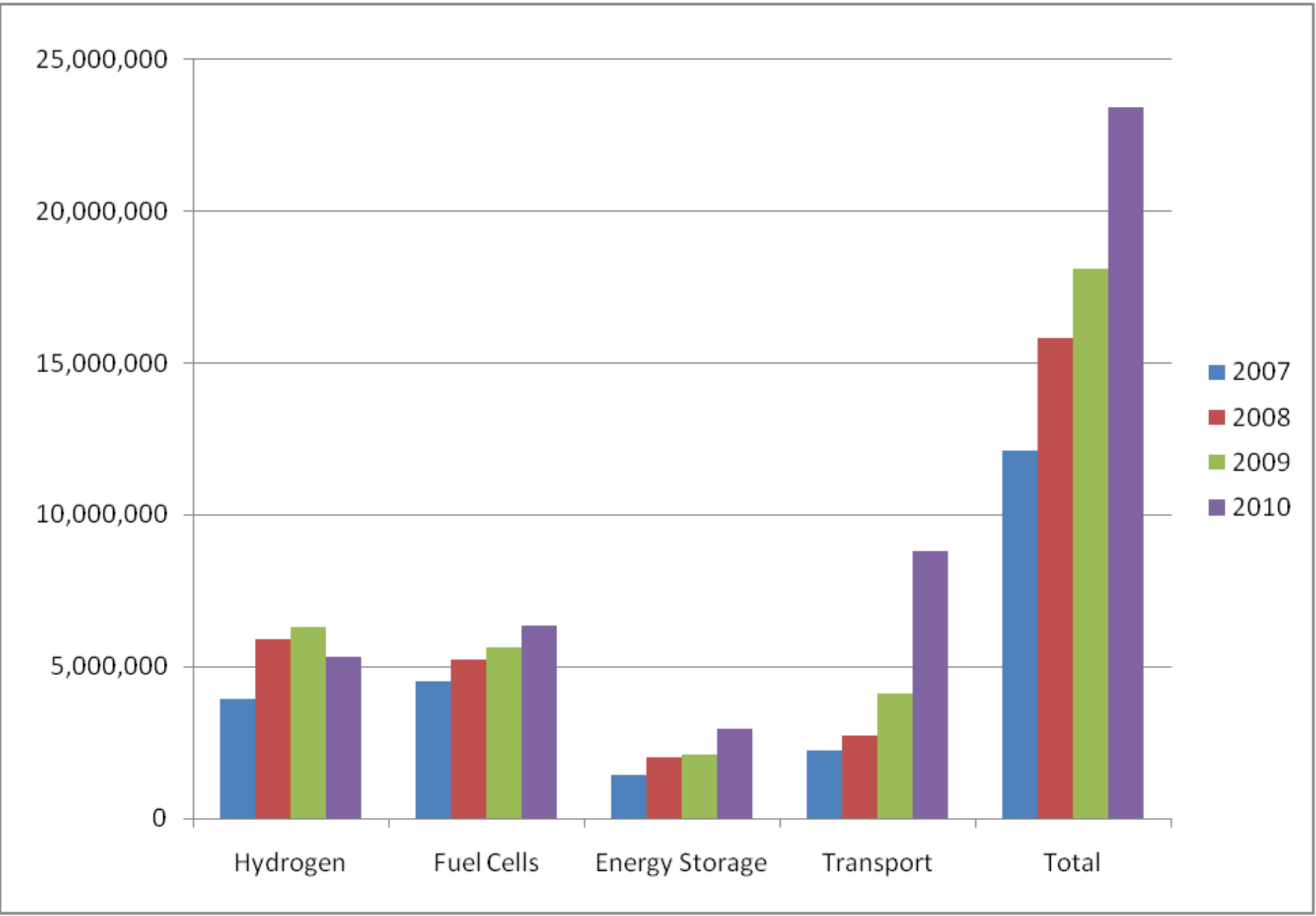
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Hydrogen
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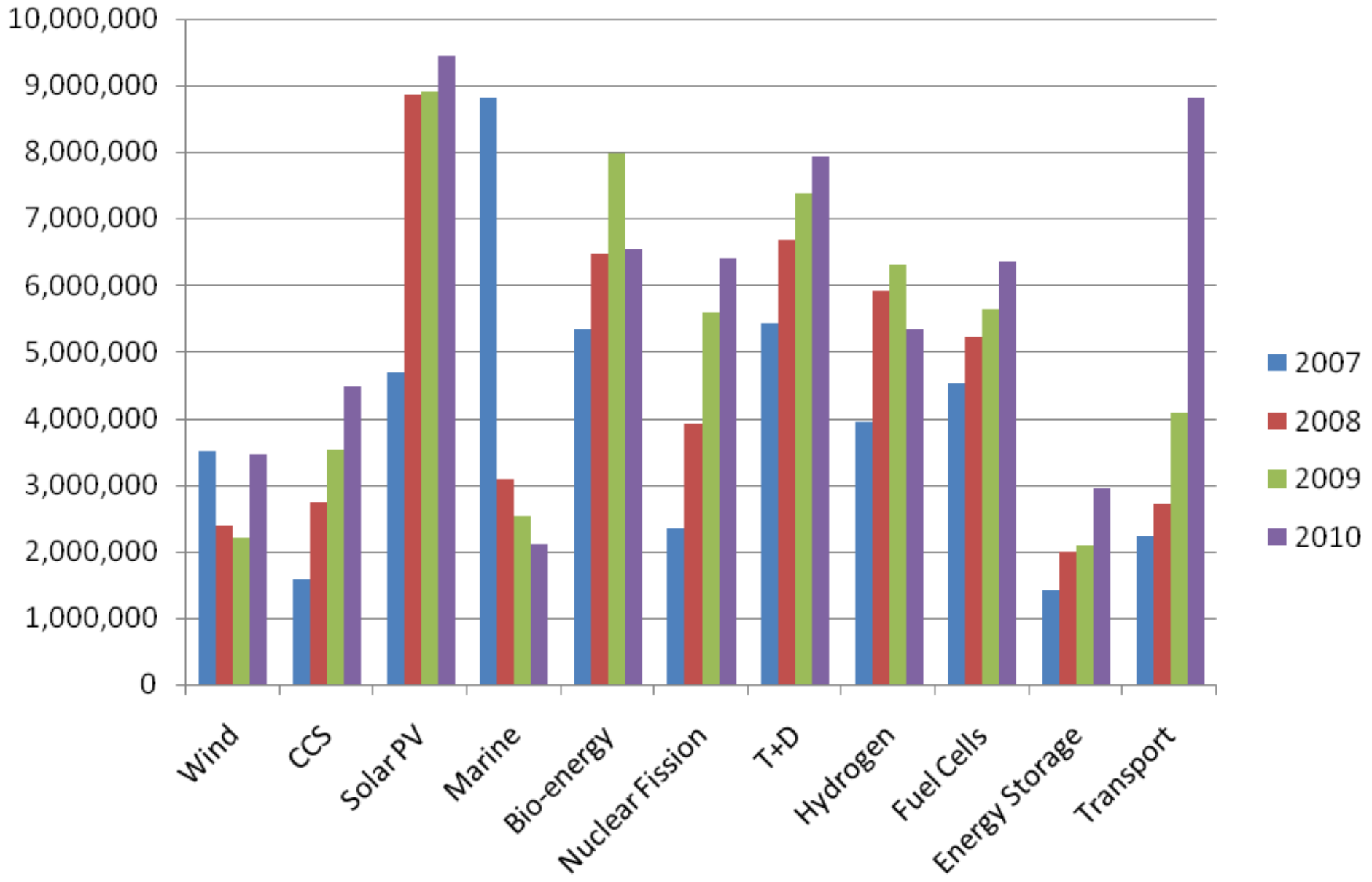
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Nuclear Fission
T+D
Hydrogen
Fuel Cells
Energy Storage
Transport
2007
2008
2009
2010

National Energy Research Atlas

"an authoritative and comprehensive account of capabilities and unsolved research problems across the energy domain"

Research landscape
characterising energy-related research activities and capabilities in the UK (programme level)

Research register
an on-line searchable database of energy-related awards and projects

Research roadmaps
identifying the sequence of research (and other) problems to be overcome before new technologies can be commercially viable

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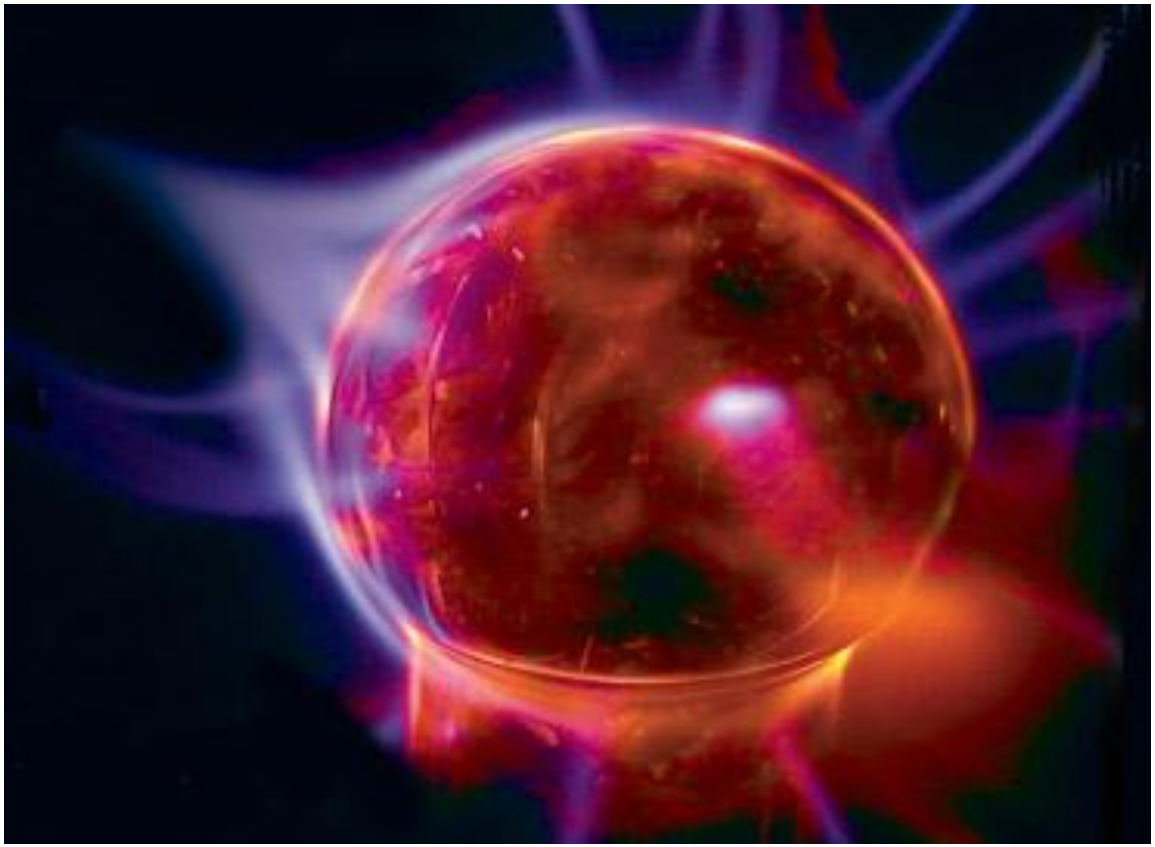
Looking further forward



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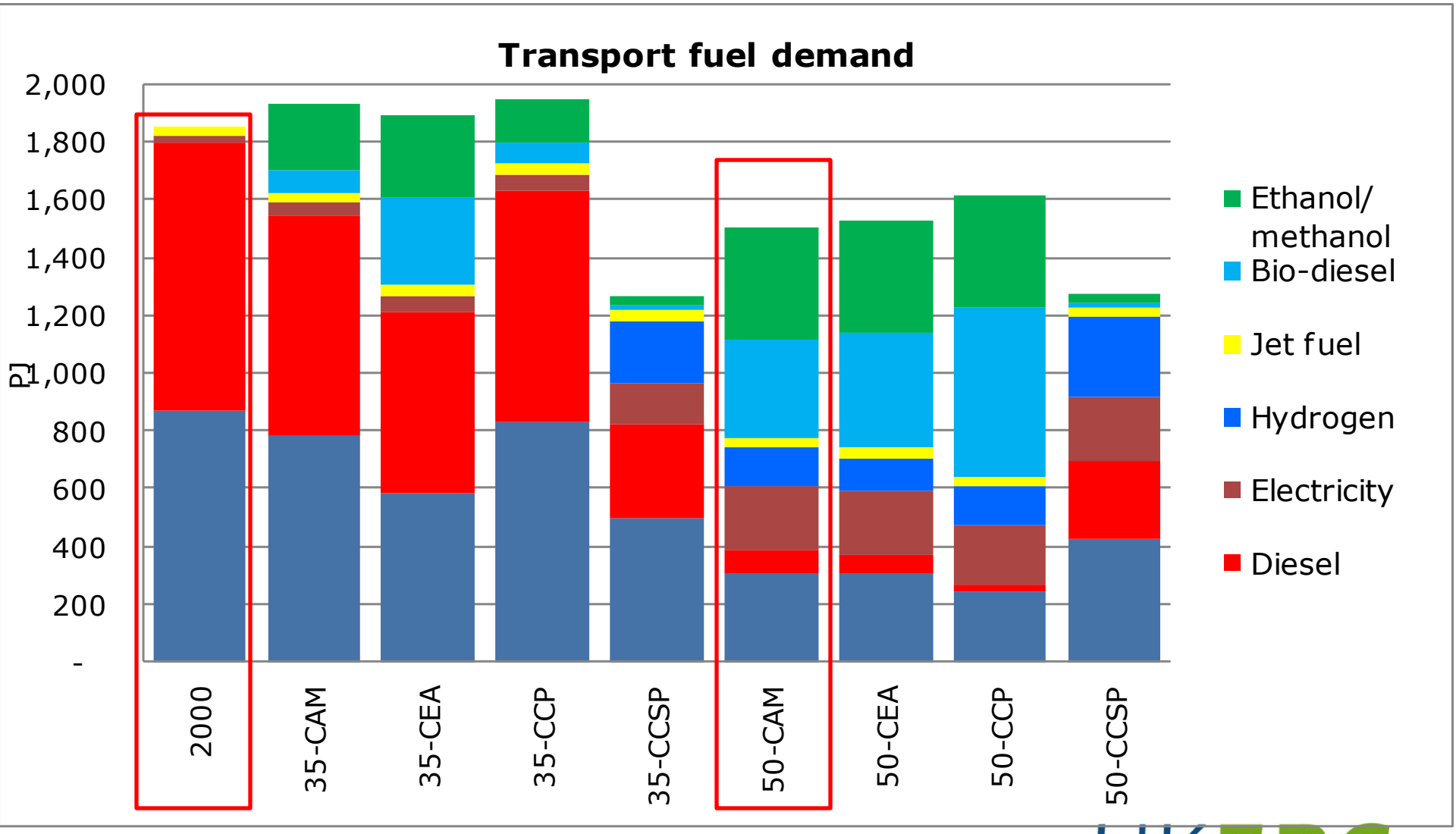
Cumulative Cases: Transport Fuels



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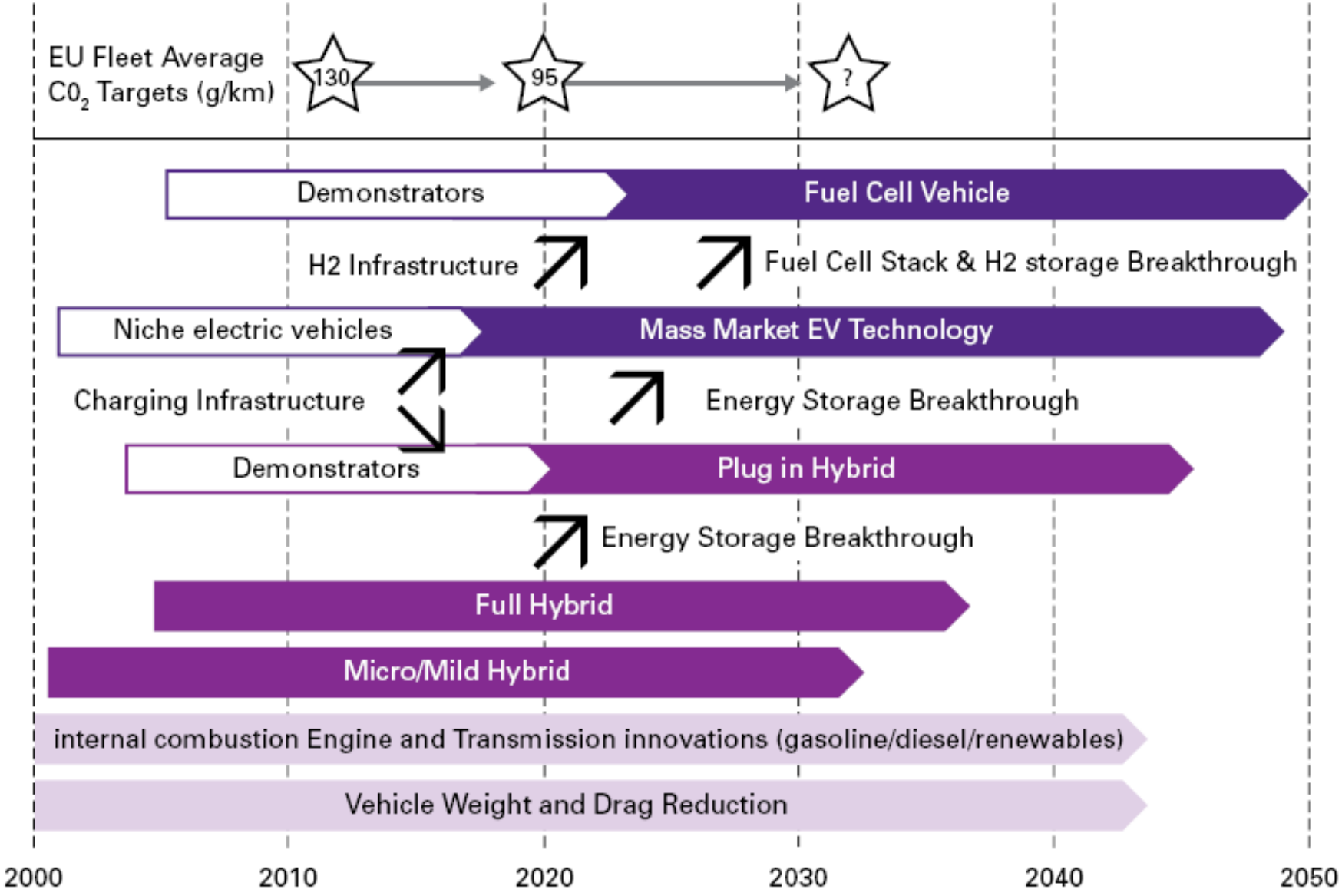

Source: An Independent Report on the Future of the Automotive Industry in the UK, New Automotive Innovation and Growth Team (NAIGT) (2009)

Summary

- UK has an ambitious ultra low carbon vehicle programme
- Key issues:
  - Cost
  - Batteries
  - Smart grids
  - Charging points
- Electric vehicles are not in themselves a magic bullet

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