The 4th carbon budget and beyond – an electric future?

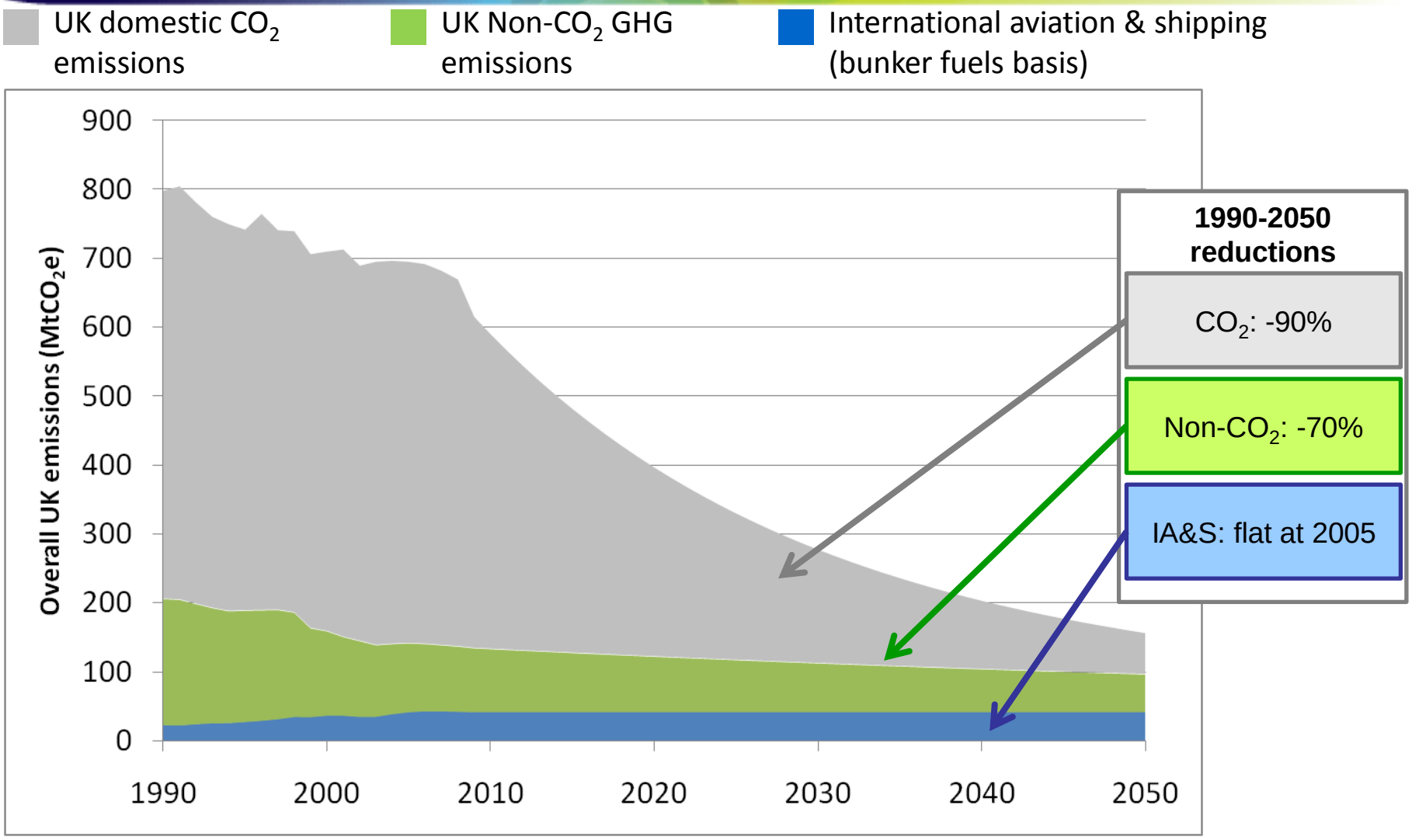
Adrian Gault
Chief Economist
Committee on Climate Change

Presentation at BIEE conference, "Is the Future Electric?"
22 September 2011

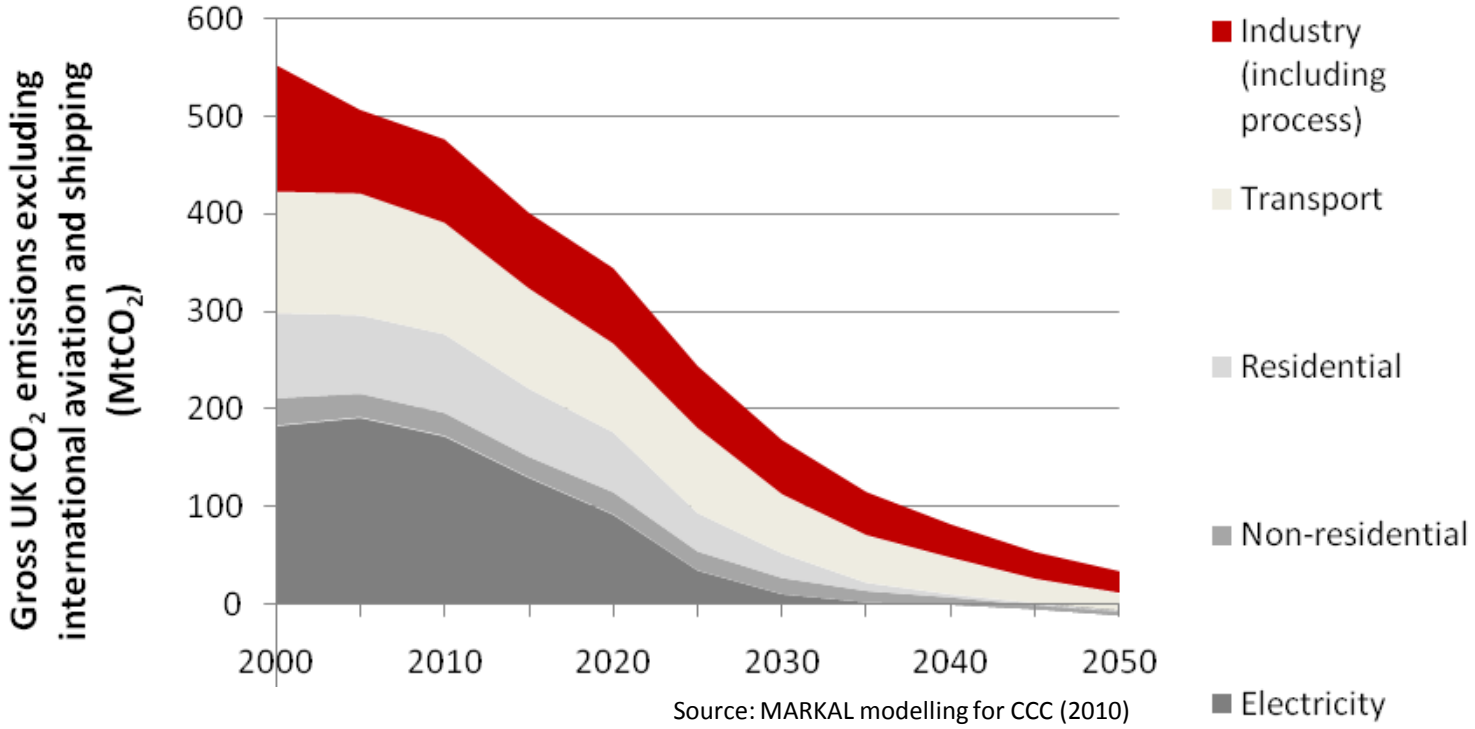
Key points

- 2050 emissions target requires **more than 80%** reductions in energy CO_2
- CCC's **fourth budget** analysis identified significant changes towards this required by 2030, based on decarbonising electricity and extending to other sectors
  - **Renewable heat** likely to be cost-effective in many applications by 2030
  - Majority of new **cars** should be ultra low-carbon (electric) by 2030
  - The **power** sector should be largely decarbonised by 2030
- **Gas** has important but declining role

80% target will require >80% reductions in some sectors



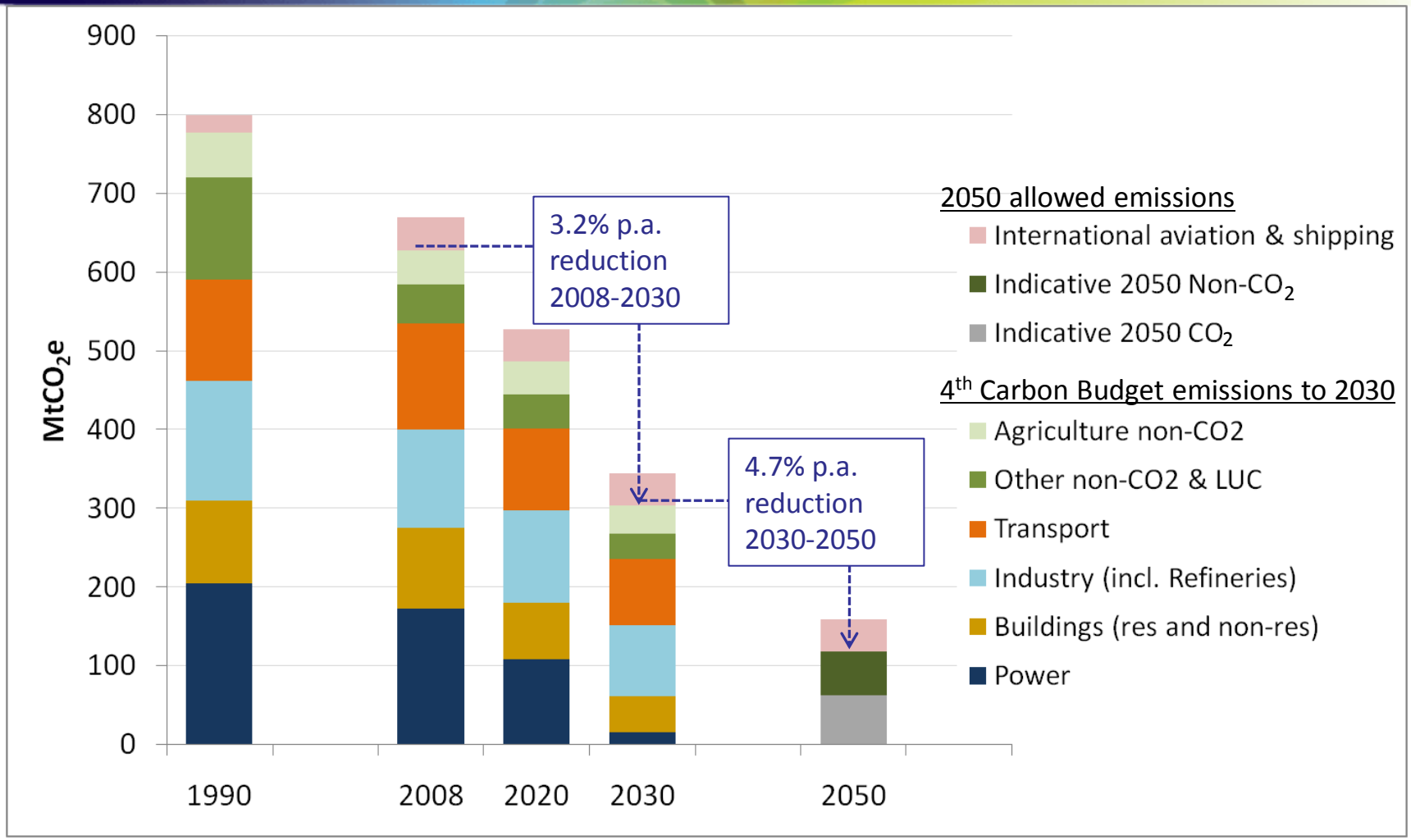
Industry likely to be hardest to reduce -> Energy CO_2 will have to be close to zero-carbon by 2050



Source: MARKAL modelling for CCC (2010)

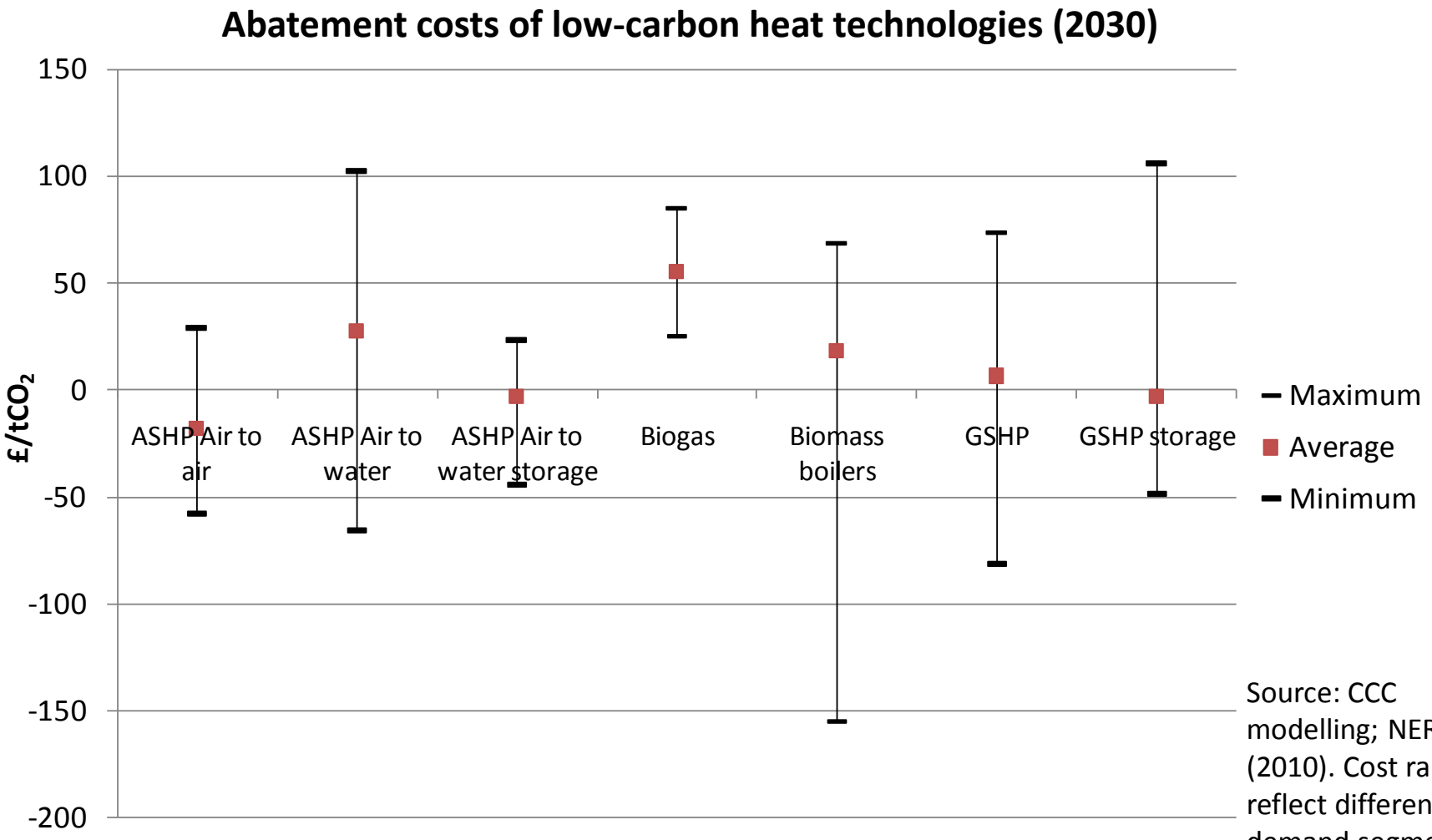
Full deployment of CCS at suitable sites, together with diversion of biogas and biomass from heating buildings (replaced by electrification) would still leave emissions at over 40 $MtCO_2$ (from a CO_2 pot of around 60-70 $MtCO_2$ for 2050)

Fourth Carbon Budget: a feasible and cost-effective scenario for 2030, appropriate on the path to 2050



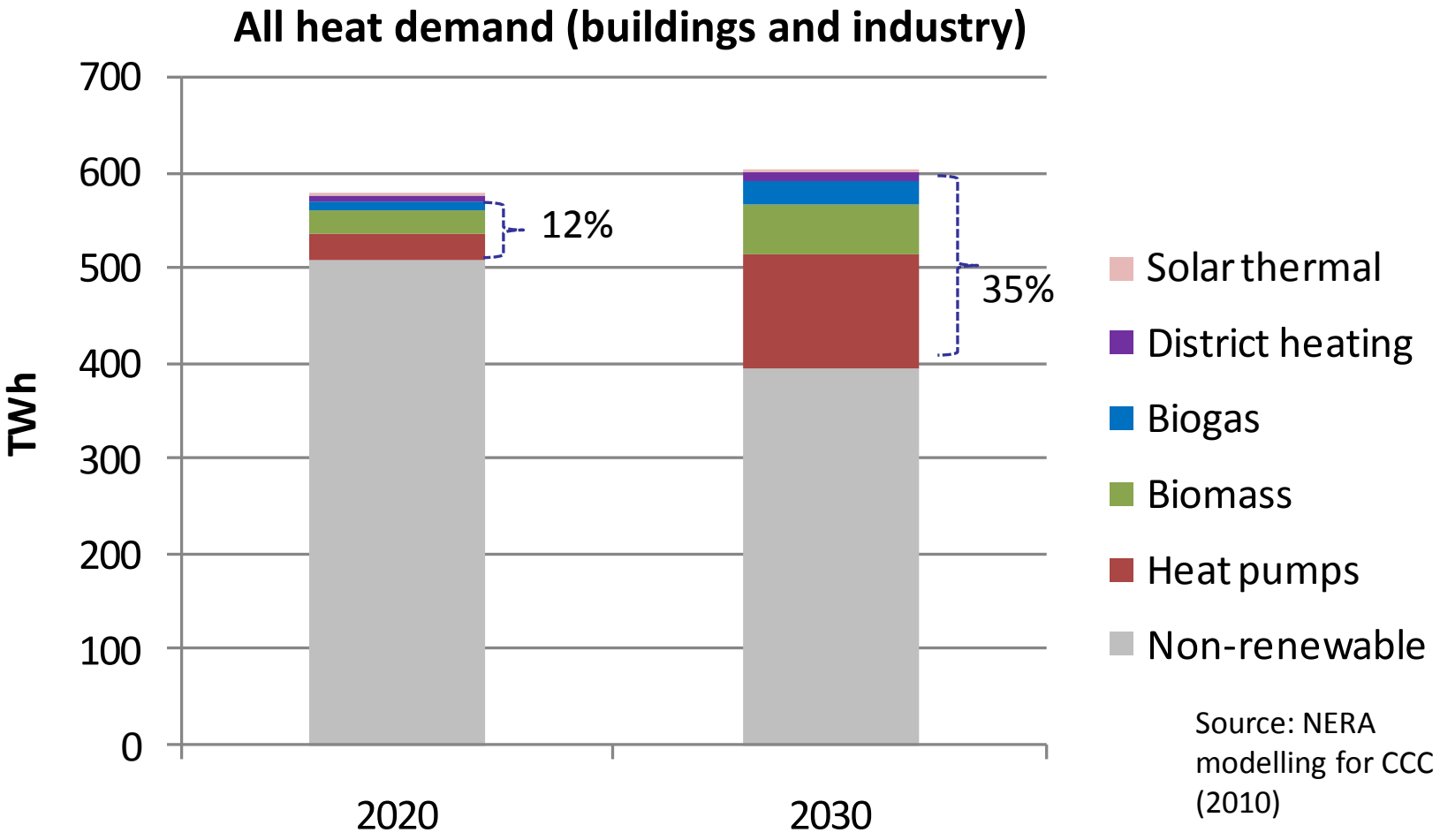
Source: CCC (2010) The Fourth Carbon Budget

Heat: By 2030 a range of renewable heat technologies will be cost-effective in various applications



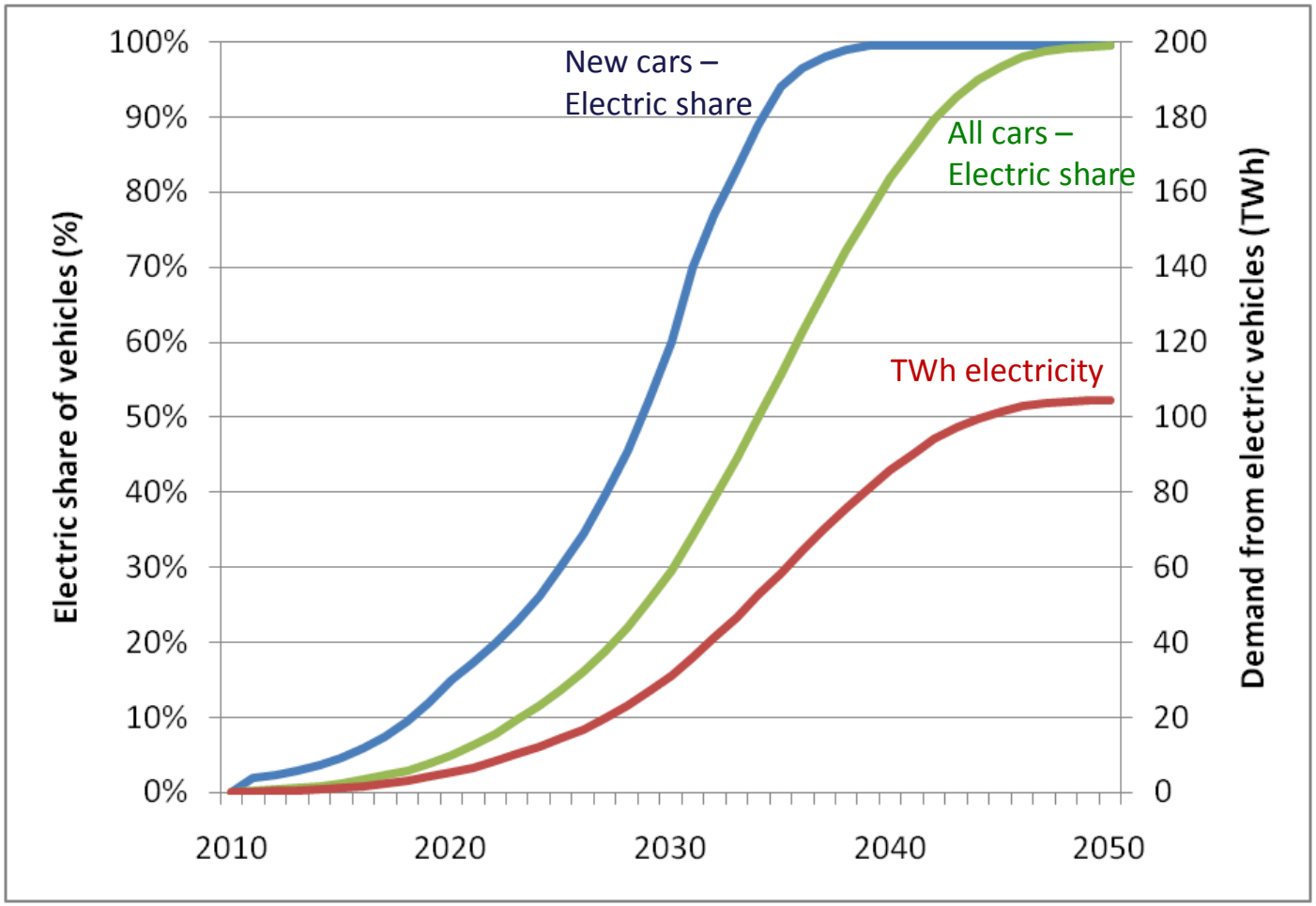
Source: CCC modelling; NERA (2010). Cost ranges reflect different demand segments

Major expansion of renewable heat therefore appropriate to 2030, with progress required by 2020



-> Electricity in heating: +20 TWh by 2030, + 50 TWh by 2050

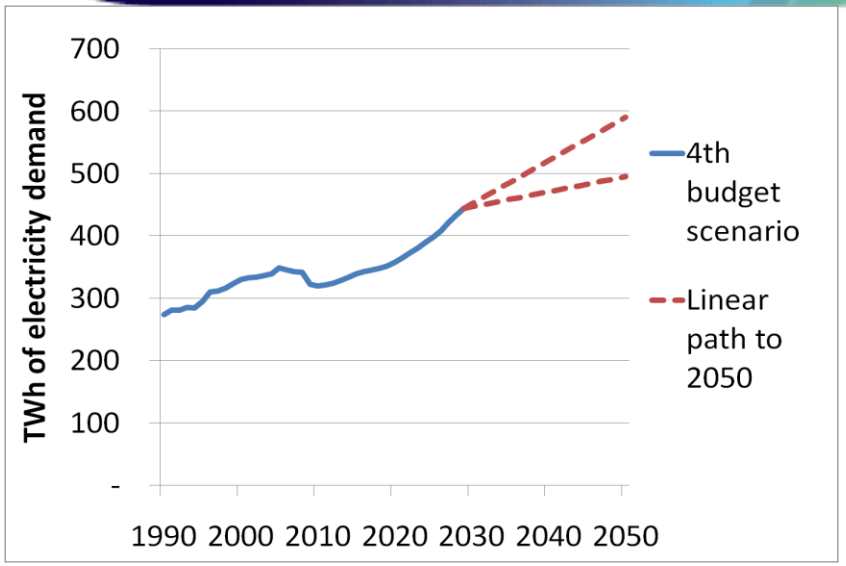
Cars: Low-carbon vehicles need to be 60% of new sales in 2030, with sharpest electricity increases after 2030

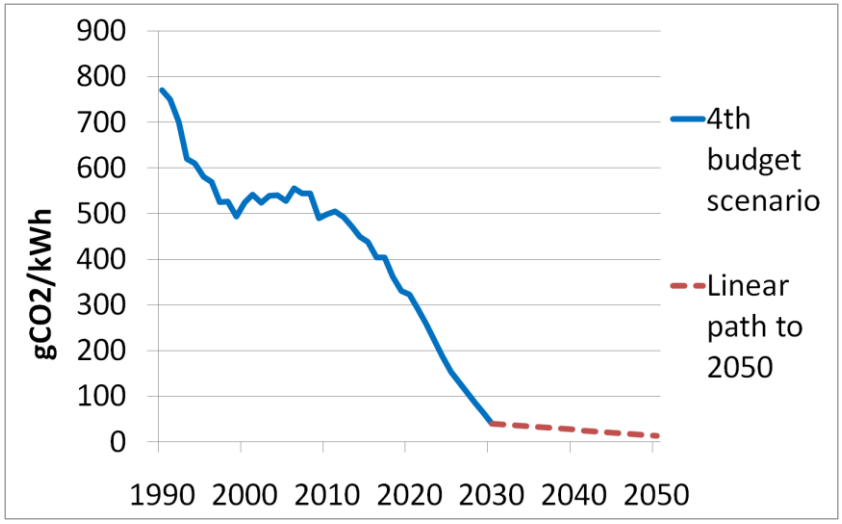


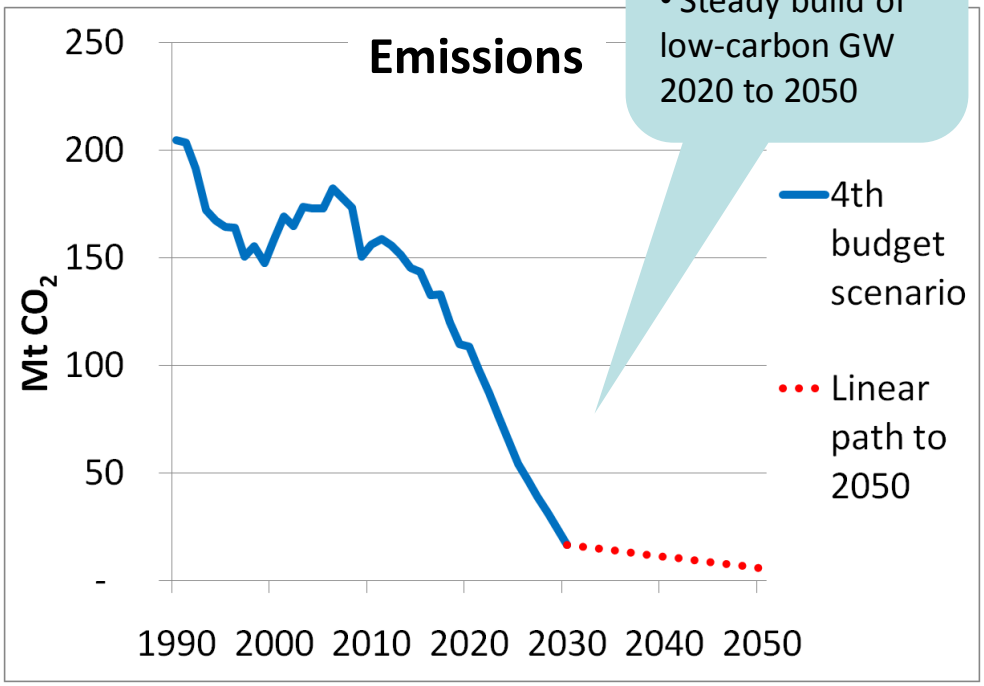
Source: illustrative calculation only, based on CCC Fourth Budget scenarios

Electric load for transport potentially flexible and off-peak

Power: Emissions intensity will have to decrease, whilst demand is likely to increase

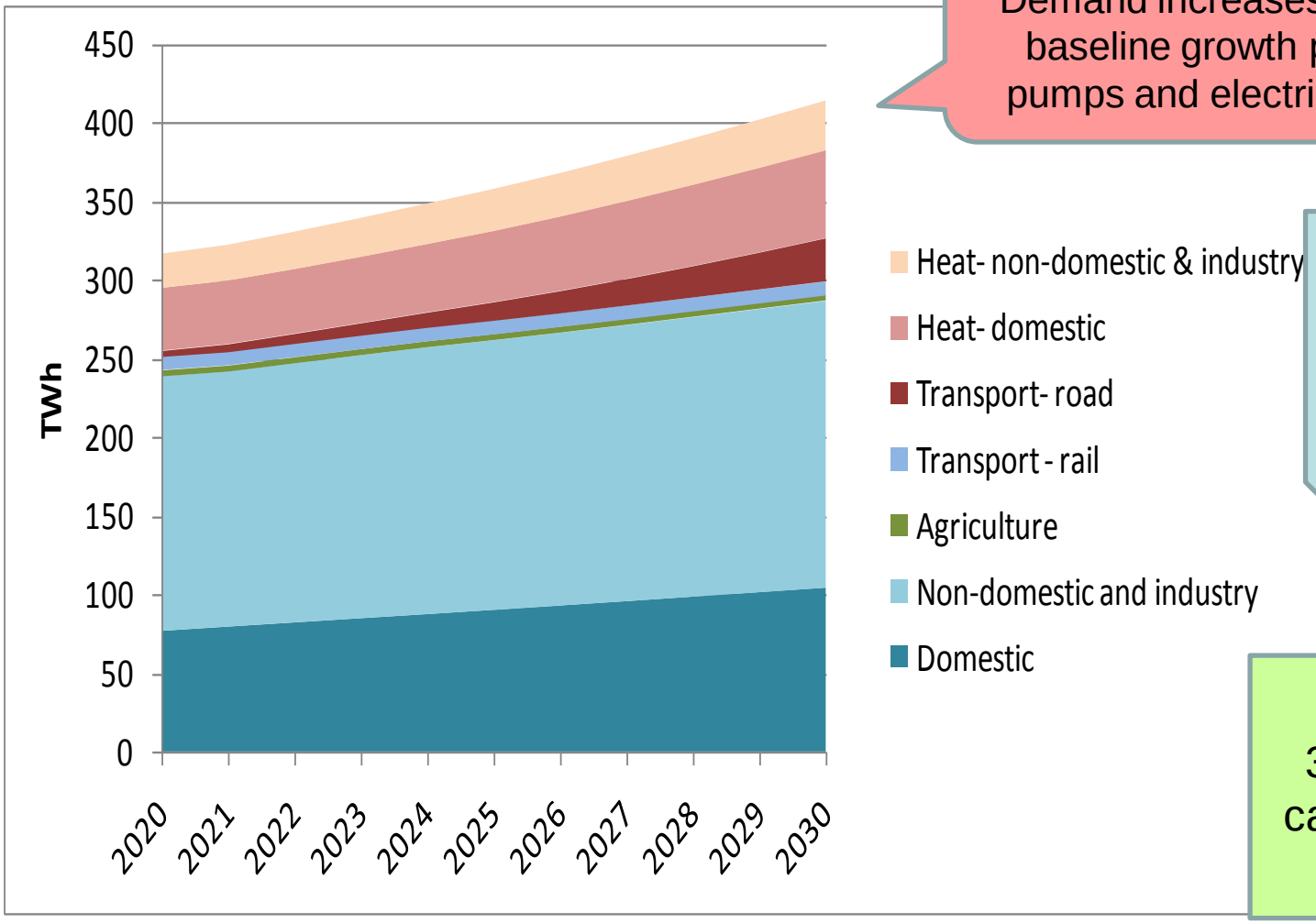






Source: Medium scenario and range of MARKAL model runs for CCC (2010) The Fourth Carbon Budget

New capacity needed to 2030 due to increased demand and retirements

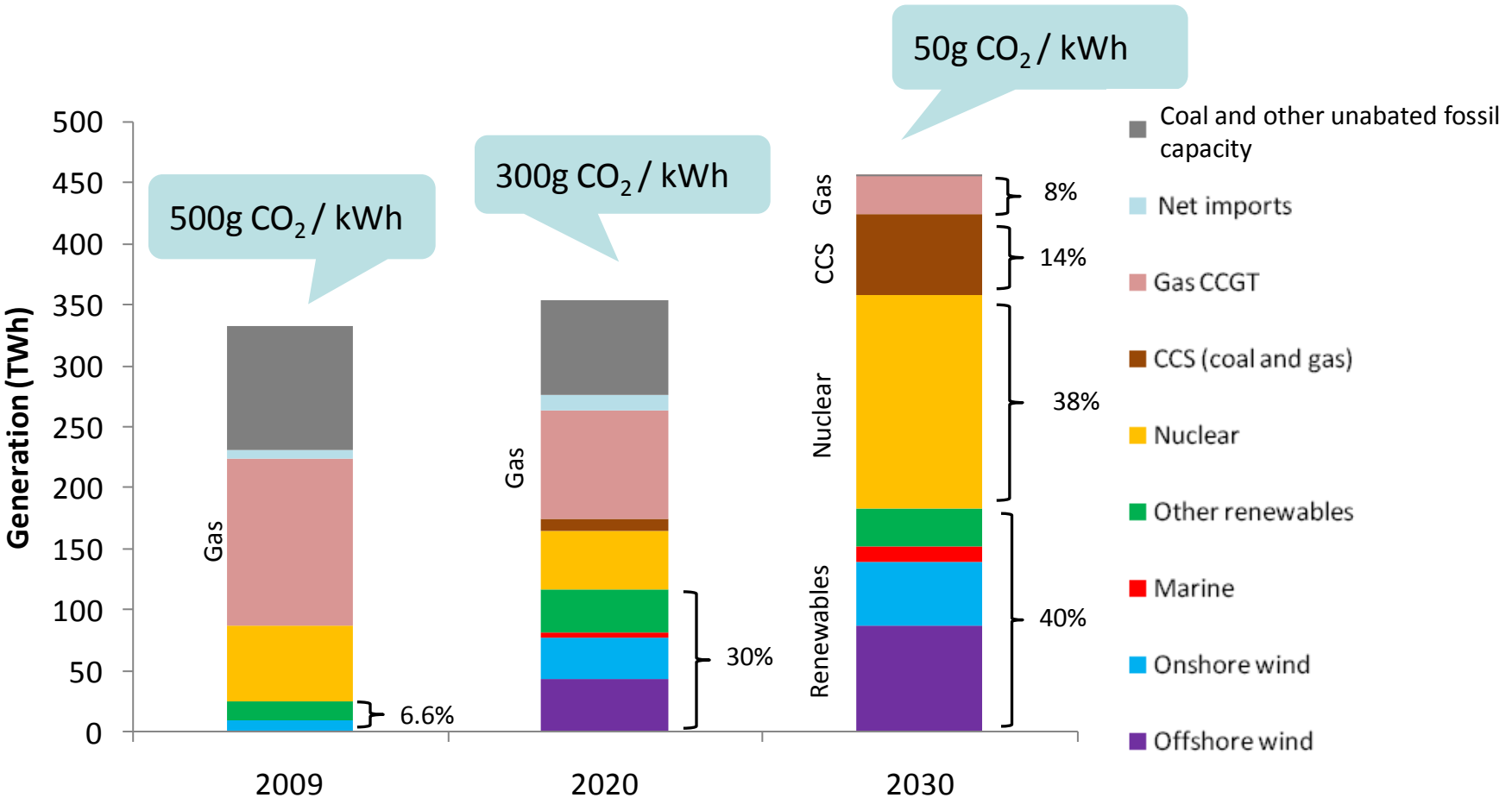


Demand increases driven by baseline growth plus heat pumps and electric vehicles

Plus 27 GW capacity expected to retire, reflecting age and IED

30-40 GW new capacity required

An illustrative scenario for power sector decarbonisation to 2030 – 40% renewable, 40% nuclear



Source: DUKES (2010), CCC Calculations, based on modelling by Pöyry Management Consulting. Includes losses, excludes generator own-use and autogeneration.

Intermittency: There are a range of flexibility options that can keep the lights on when the wind does not blow (and fully utilise low-carbon resources when it does)

E.g. when wind doesn't blow:

- Movable demand shifts to overnight
- Interconnector swings into import mode
- Generation from storage where available (e.g. bulk storage, vehicle-to-grid)
- CCGT and other flexible generation ramps up

→ Renewable shares up to e.g. 65% in 2030 and 80% in 2050 could in principle be managed at a cost likely to be low relative to the cost of generation

Gas use without CCS phased out by 2050, with declining but important role during transition

Gas in the power sector

- Important back-up role in 2030 – TWh down, GW up (network challenges)
- Some new build to 2020, very limited after 2020
- With CCS, depending on technology development

Major expansion in CCGT to 2030 raises risks over CCS viability, cost and acceptability and may fail to develop alternatives.

Gas in the heat sector

- More efficient use:
  - Boiler replacement to 2030 remains low-cost option
  - Some CHP (micro and large)
- Fuel switching in industry
- Biogas?
  - Availability uncertain, but likely to be limited compared to current gas demand
  - Industrial use particularly attractive (clean, high-grade)

Key points

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Future work of the Committee

Shipping Review (autumn 2011)

- Develop scenarios for UK international shipping emissions

Bioenergy Review (late 2011)

- Develop scenarios for availability of sustainable bioenergy
- Consider where available sustainable bioenergy would best be used

Advice on inclusion of aviation and shipping (spring 2012)

- Required under CC Act to enable Government decision by end 2012
- Build on considerations on 4th carbon budget report & Shipping Review

Advice to the devolved administrations (2011-12)

- Progress reducing emissions

Adaptation (2011-12)

- Assessment of UK preparedness and advice to Scotland and Wales
- Continuing advice on UK's Climate Change Risk Assessment

Fourth budget review (2013-14)