



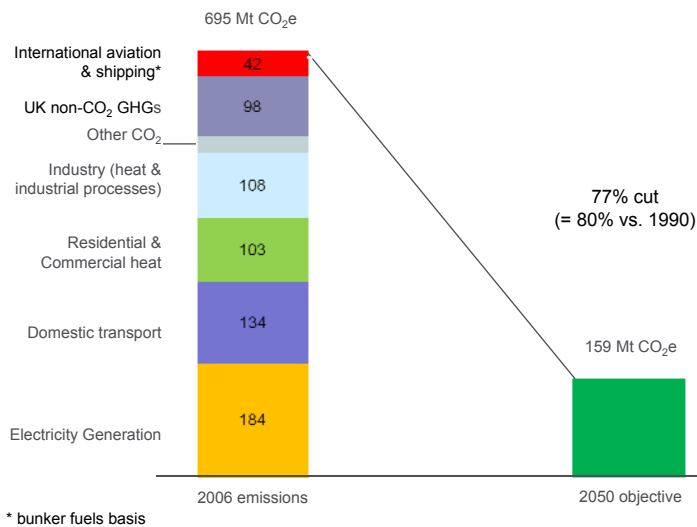
Low CO₂: urgent & radical

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Get a move on.
You have a
choice, I don't

The scale of the UK CO₂ challenge



Committee on Climate Change December 2008

To put it another way...

- ▶ In 2050 total CO_{2e} per head needs to be 2.1 – 2.6 tonnes per annum
- ▶ ***An average new car today (160g/km), driven 15,000km per year, emits 2.4 tonnes per annum***

ACTION: no technology, immediate impact

Behaviour change: 20% immediate, 35% longer term reduction in CO₂/km

- ▶ Consumer/driver behaviour has a big effect on CO₂ from road transport
 - ▶ vehicle choice: current best in class 25 - 30%
 - ▶ downsize....
 - ▶ eco driving: up to 15%
 - ▶ enforced and lower speed limits
 - ▶ reduced marginal car use
 - ▶ car clubs, car sharing, modal shift...
- ▶ It won't be miserable and it saves you money...
 - ▶ at near zero upfront cost
 - ▶ and ongoing savings to the consumer/fleet operator
- ▶ Policy challenges:
 - ▶ environmental awareness and action in road transport lags other sectors
 - ▶ powerful cars are symbols of status – and are where profit is made
 - ▶ people tend to discount heavily future fuel cost savings
 - ▶ acceptability of 'restricting personal freedom'
 - ▶ avoiding the rebound effect
- ▶ Budget missed opportunity: scrappage scheme only for new vehicles below 130g/km

This bit is up to us!

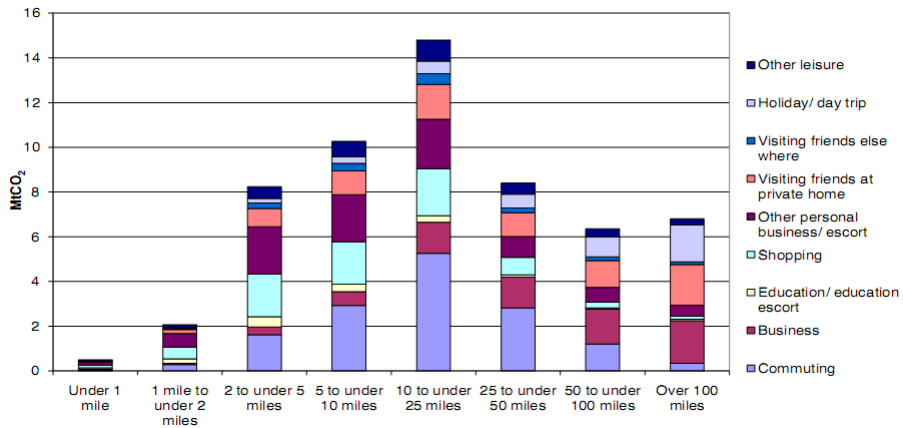
ACTION: technology options

Because delivering behaviour change is difficult

and we need 90% per km reduction by 2050

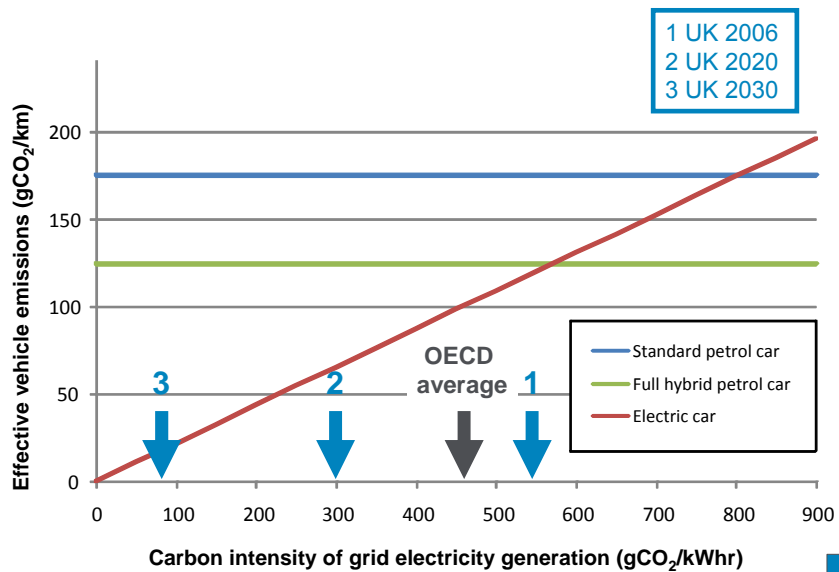
- ▶ **Biofuels...but...**
 - ▶ new technologies which don't compete with food
 - ▶ avoid land use change emissions
 - ▶ internationally agreed, verifiable certification systems required
 - ▶ not the most efficient way to use biomass
- ▶ **Advanced technology for 'conventional' vehicles...yes, but...**
 - ▶ plenty of options – 30% plus improvement in emissions available now
 - ▶ direct injection, variable valve actuation, cylinder-deactivation, regenerative braking, stop-start, variable drive technology, weight reduction, aerodynamics, improved lubricants, surface treatments to reduce mechanical friction, low resistance tyres...
 - ▶ increases purchase costs – but savings over life of vehicle
 - ▶ can't deliver 90% reduction per km needed for 2050 – so we need to invest in step change
- ▶ **Hydrogen...keep going**
 - ▶ hydrogen storage
 - ▶ hydrogen production
 - ▶ hydrogen distribution
 - ▶ costs
- ▶ **Electric...yes, now**
 - ▶ full electric and plug-in hybrid

77% CO₂ emissions are within today's electric range



93% of trips and 62% of CO₂ emissions: journeys of less than 25 miles
97% of trips and 77% of CO₂ emissions: journeys of less than 50 miles

Electric cars: emissions



Courtesy David Joffe, Committee on Climate Change 2008

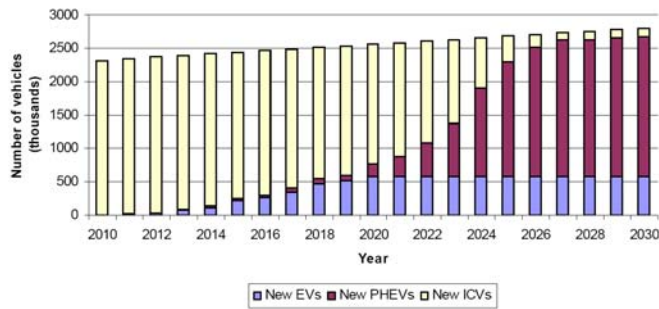
Today's battery technology and range of 60 miles

All sub 50 mile journeys on electricity would reduce emissions by 24%

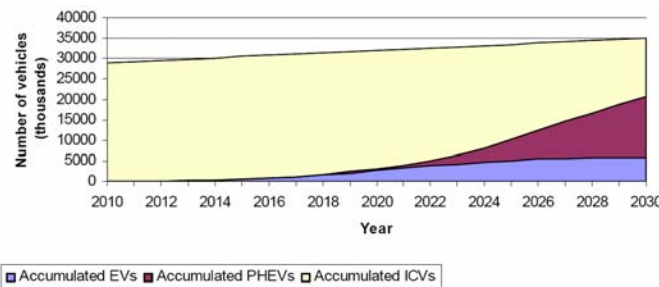
By 2030 the reduction would be 70%

EVs: how much of these saving could we achieve?

New car sales by year (extreme range scenario)



Number of cars in the UK car parc (extreme range scenario)



Arup/CENEX report
for BERR and DfT 2008

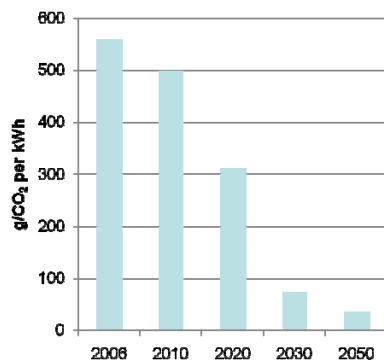
Electric vehicles are feasible now

- ▶ The infrastructure is almost in place
- ▶ Some vehicles are already available
 - ▶ highly efficient
 - ▶ ranges of 60 to 150 miles
 - ▶ some are even glamorous!
- ▶ Additional power system load is easily manageable
 - ▶ 17% additional generation capacity
 - ▶ exploit night time trough with smart metering

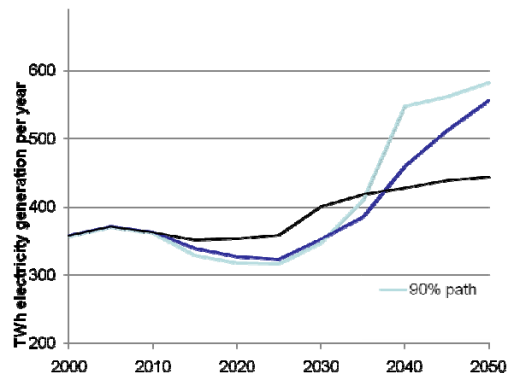


The electricity generators need EVs

Emissions intensity to 2050



Power generation to 2050



Committee on Climate Change, December 2008

Challenges

- ▶ Battery costs
- ▶ Customer perceptions and confidence
 - ▶ 'range anxiety'
- ▶ Supplier confidence
- ▶ Battery technology: life, charging time, power density...
- ▶ Standardisation
- ▶ Manufacturing and service capacity
- ▶ Facing up to the scale of change required
- ▶ But not low carbon electricity
 - ▶ we have to have that anyway

Addressing the challenges

- ▶ Costs
 - ▶ Coming down fast: Valance \$3,500 Li-ion battery for mid size electric car at scale production
 - ▶ New ownership concepts: 'pay as you go'
- ▶ New business models
 - ▶ New partners – generators, infrastructure companies, cities...
- ▶ Customer and supplier confidence
 - ▶ Policy – VED, purchase subsidies, regulatory targets
 - ▶ Demonstration
 - ▶ Charging infrastructure, standards
- ▶ Government support for manufacturing investment
- ▶ Targeted short, medium and long term research
 - ▶ Next generation batteries *for automotive*
 - ▶ End of life, lifecycle impact
- ▶ Large scale demonstrations in major cities

The biggest challenges

- ▶ Politicians, industrialists and citizens facing up to the size and urgency of the CO₂ challenge
- ▶ Brave leadership: radical solutions
 - ▶ Radical emissions policy and regulation
 - ▶ Radical technology solutions
 - ▶ Radical business models
 - ▶ Radical Government support
- ▶ Coherent strategy – not photo opportunities and announcements
- ▶ Government departments working together with a shared agenda and shared funds


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Go for it!
Particular thanks
to:

- Patrick Oliva, Michelin
- Chris Borroni-Bird, General Motors
- The King Review team, HM Treasury
- The Climate Change Committee team
- John Miles, Arup

