# Markets for Alternative and eV Technologies

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**SHIFT09**

**Cambridge**

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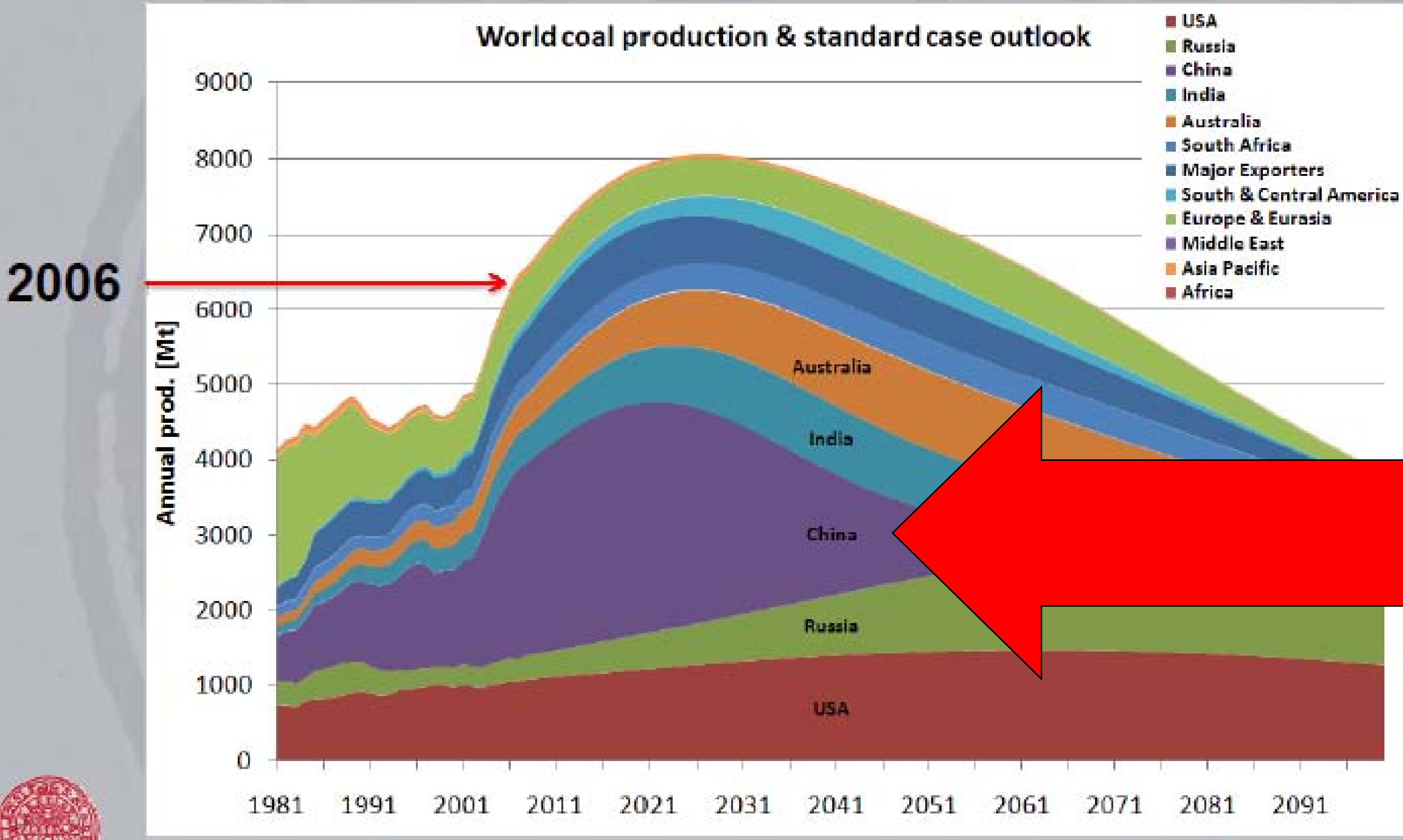
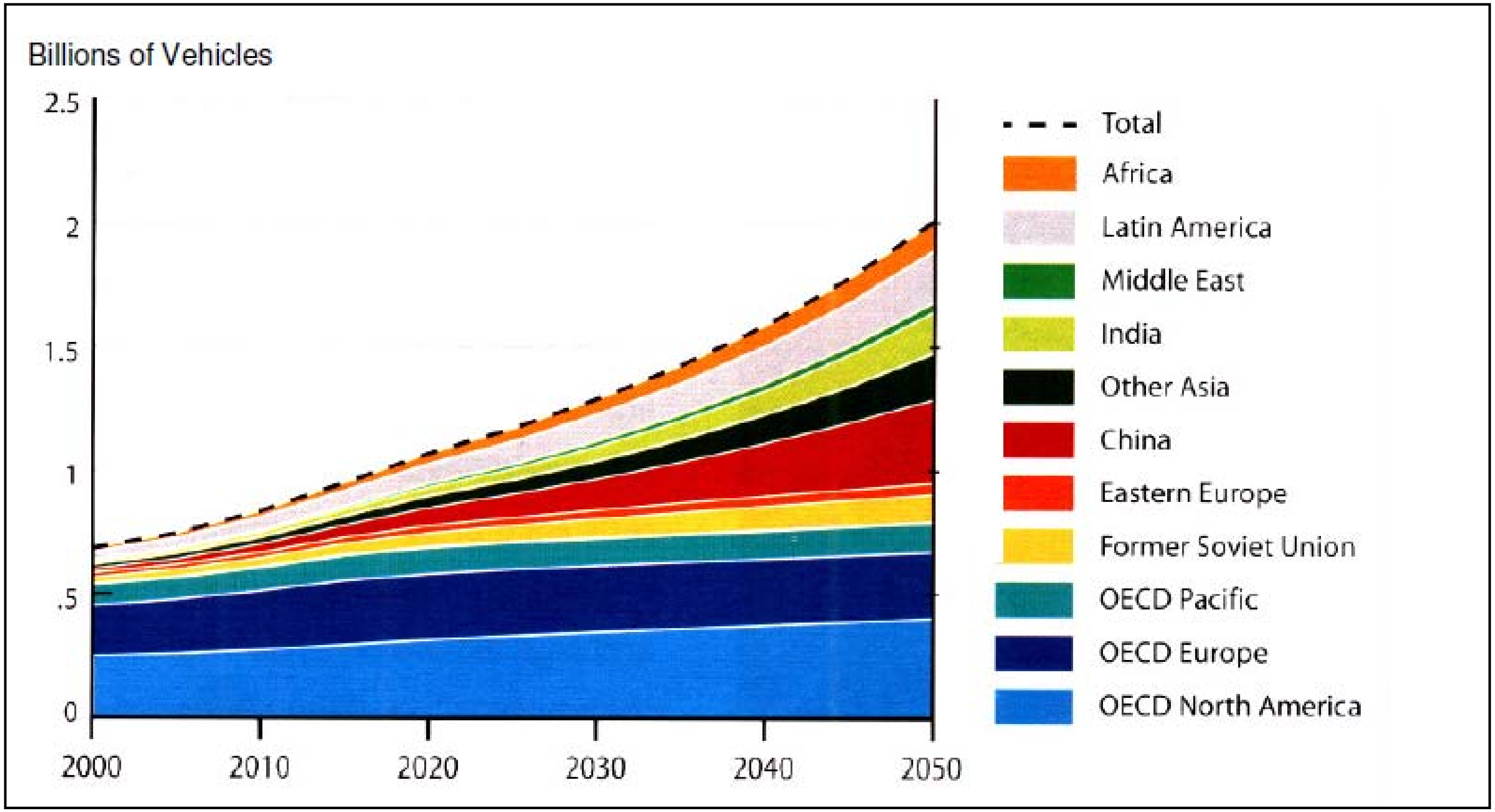
# Hot, thirsty and crowded

# Global warming

# Coal production forecast



# Population explosion




*Source: Kromer, adapted from WCSBD, 2004*

# Petroleum + ICE: a long marriage, now under stress

**Positives**

- Low-energy/$CO_2$ WTT
- Cheap materials in ICEs
- Mature technology, with some stretch still

**Negatives**

- Non-diversified energy source
- Supply-side inelasticity
- Non-transparent and volatile oil market
- Geopolitical tensions
- Poor TTW in transients

# Alternative propulsion systems

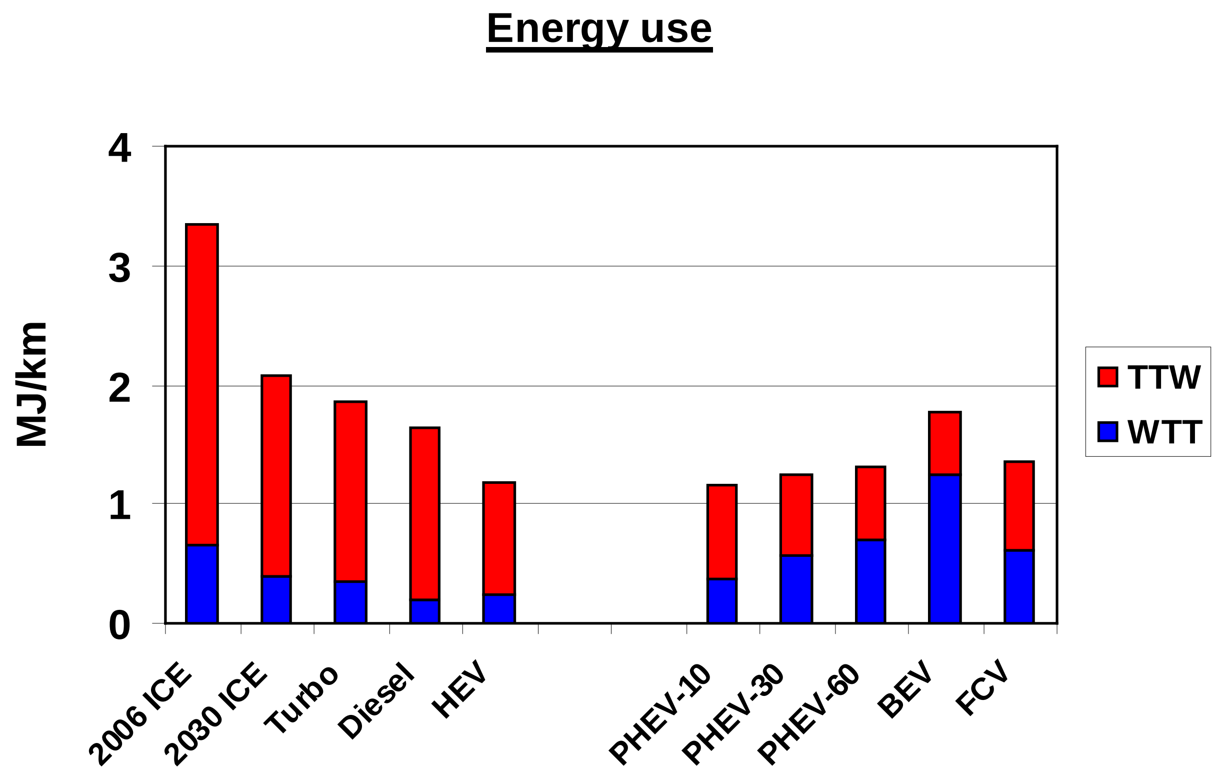
## Conventional

- Improved ICE
- HEV (parallel hybrid)
- Bio-fuels
- CNG

## Novel

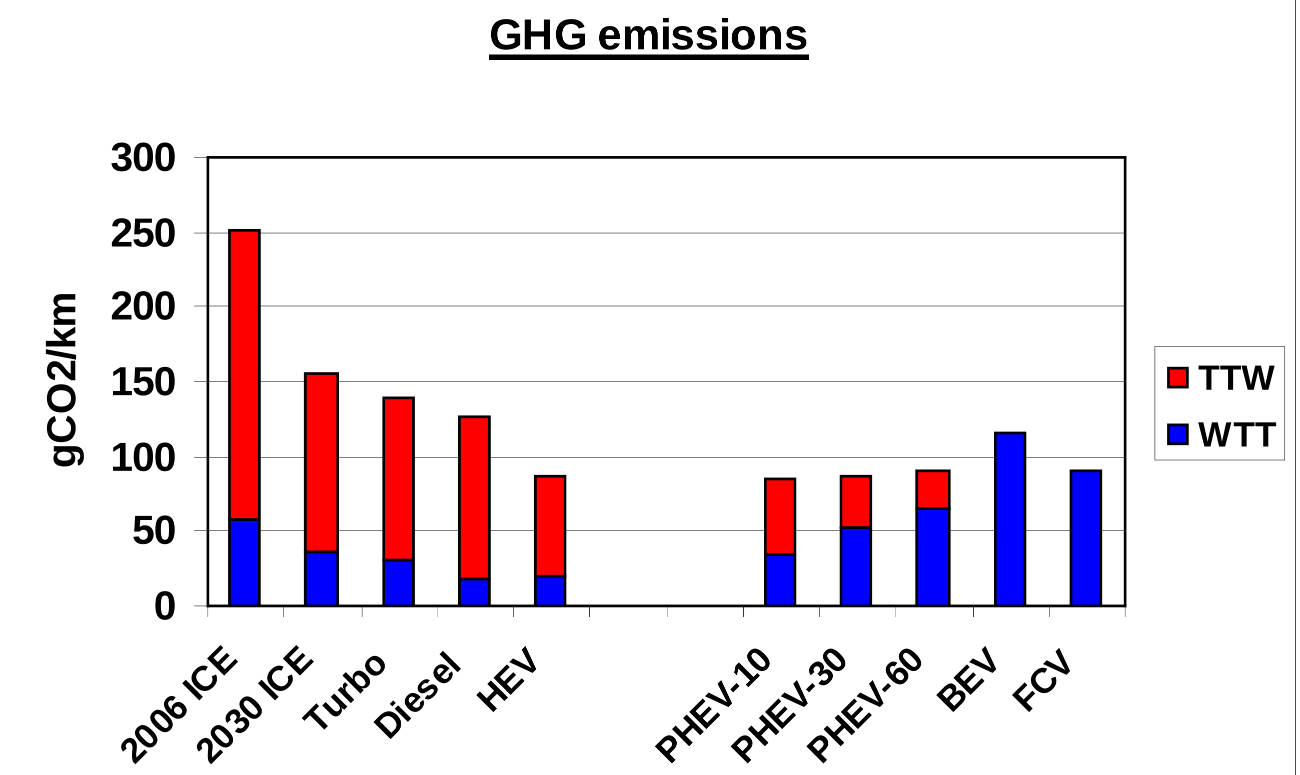
- PHEV (series hybrid)
- BEV
- FCV

# US: limited energy savings



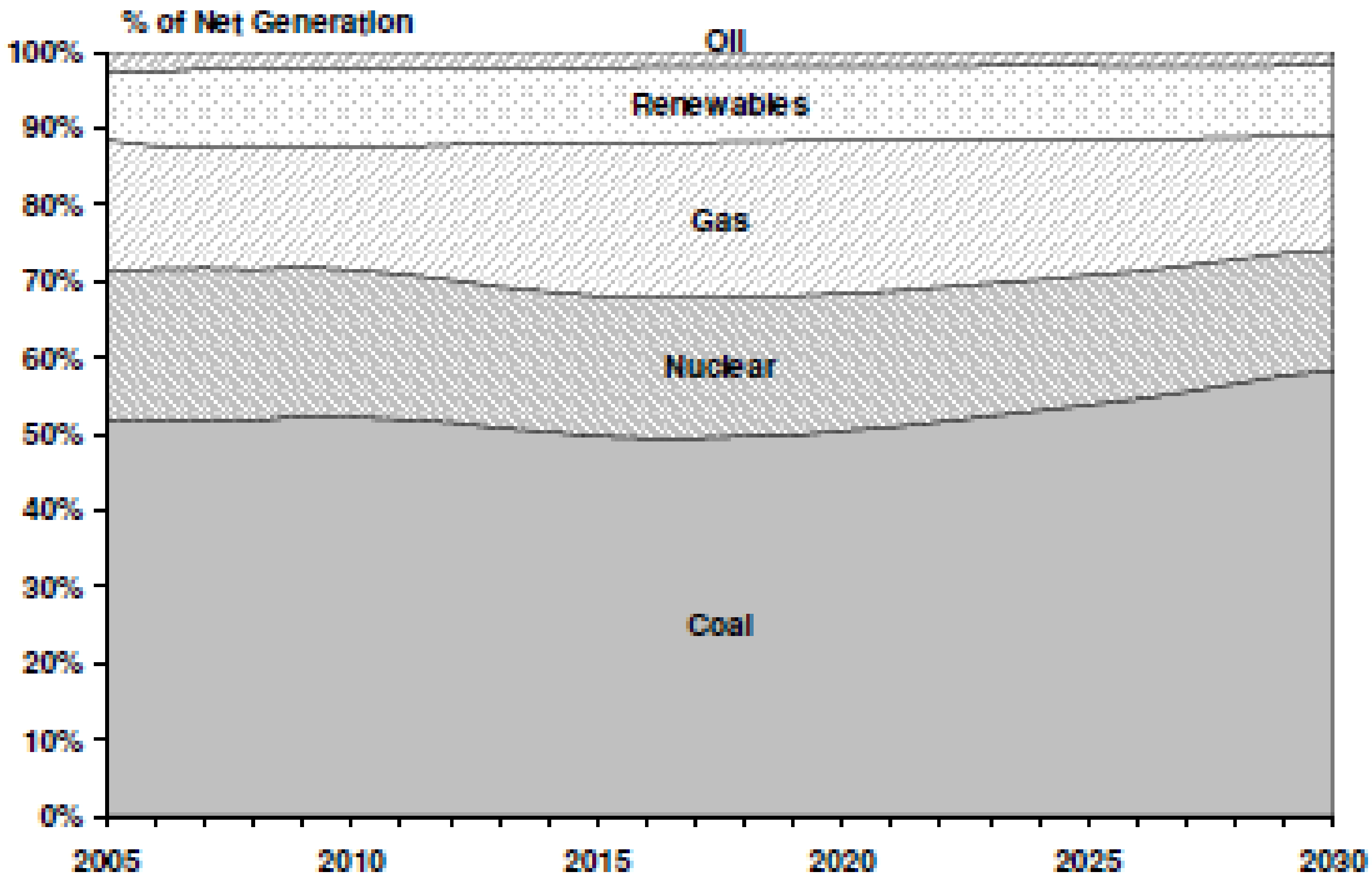

*Source: Kromer, MIT, combined, adjusted HWFET/FTP cycle*

# US: limited GHG gains



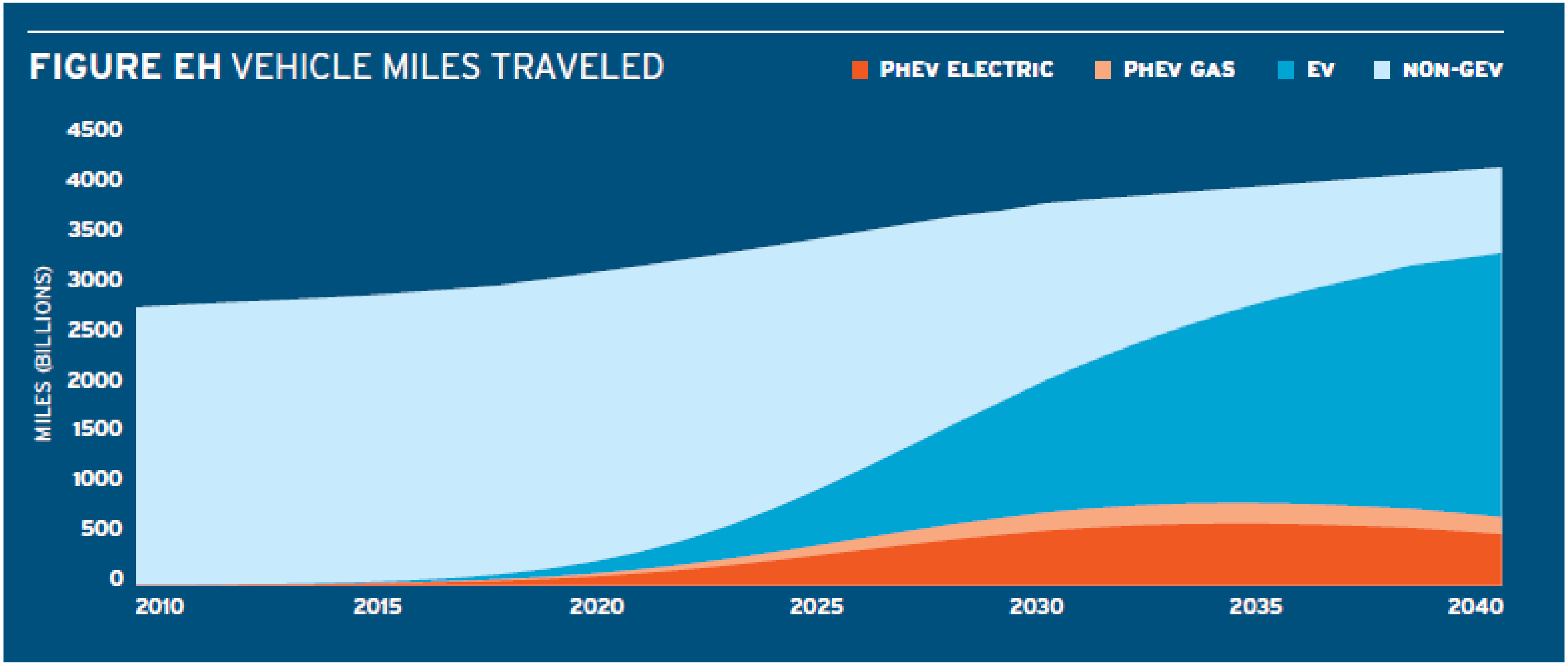

*Source: Kromer, MIT, combined, adjusted HWFET/FTP cycle*

# US Average Grid Mix, 2005-2030



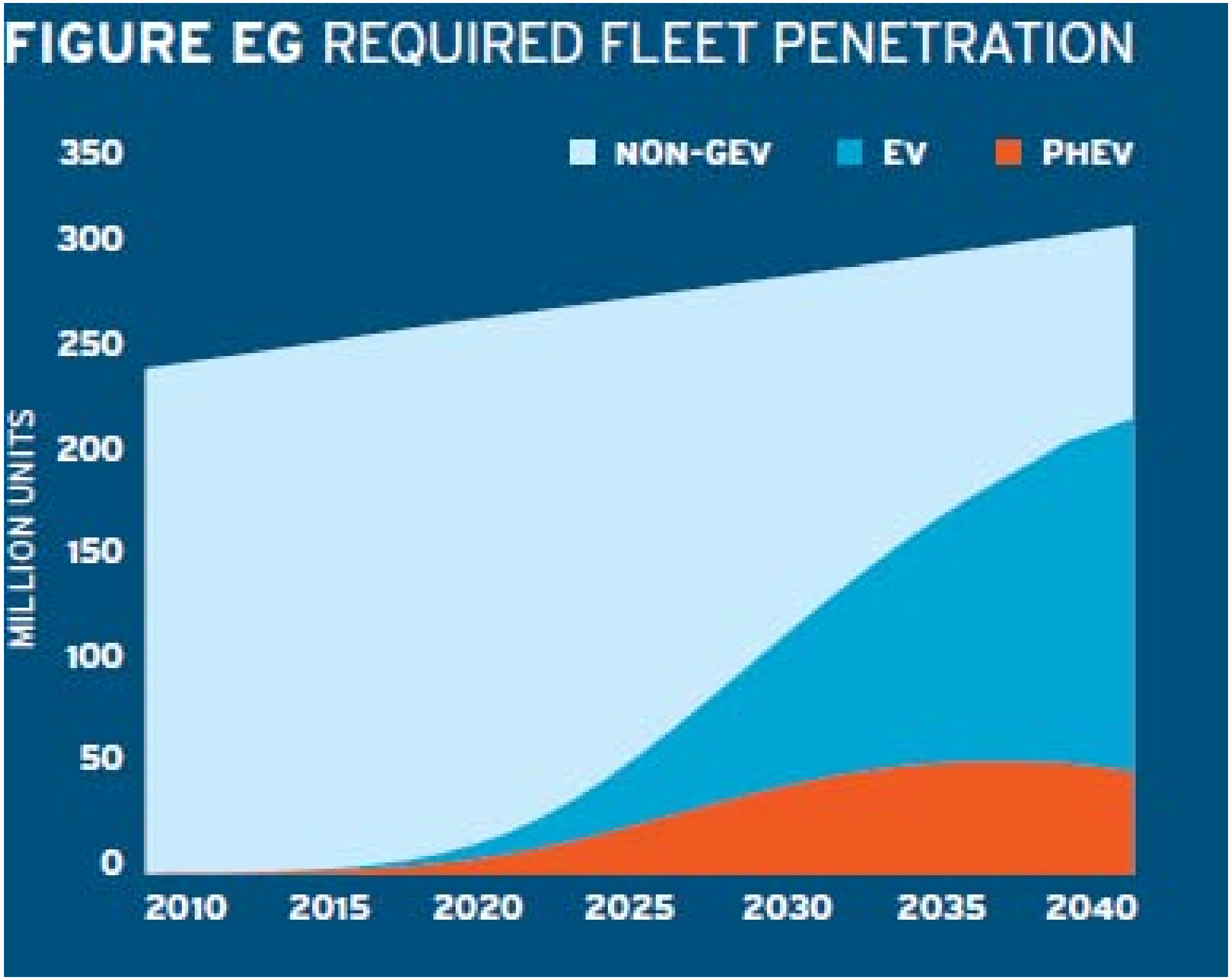

*Source: Kromer, EIA 2006*

# 75% of US VMTs to be electric by 2040




*Source: EC Roadmap*

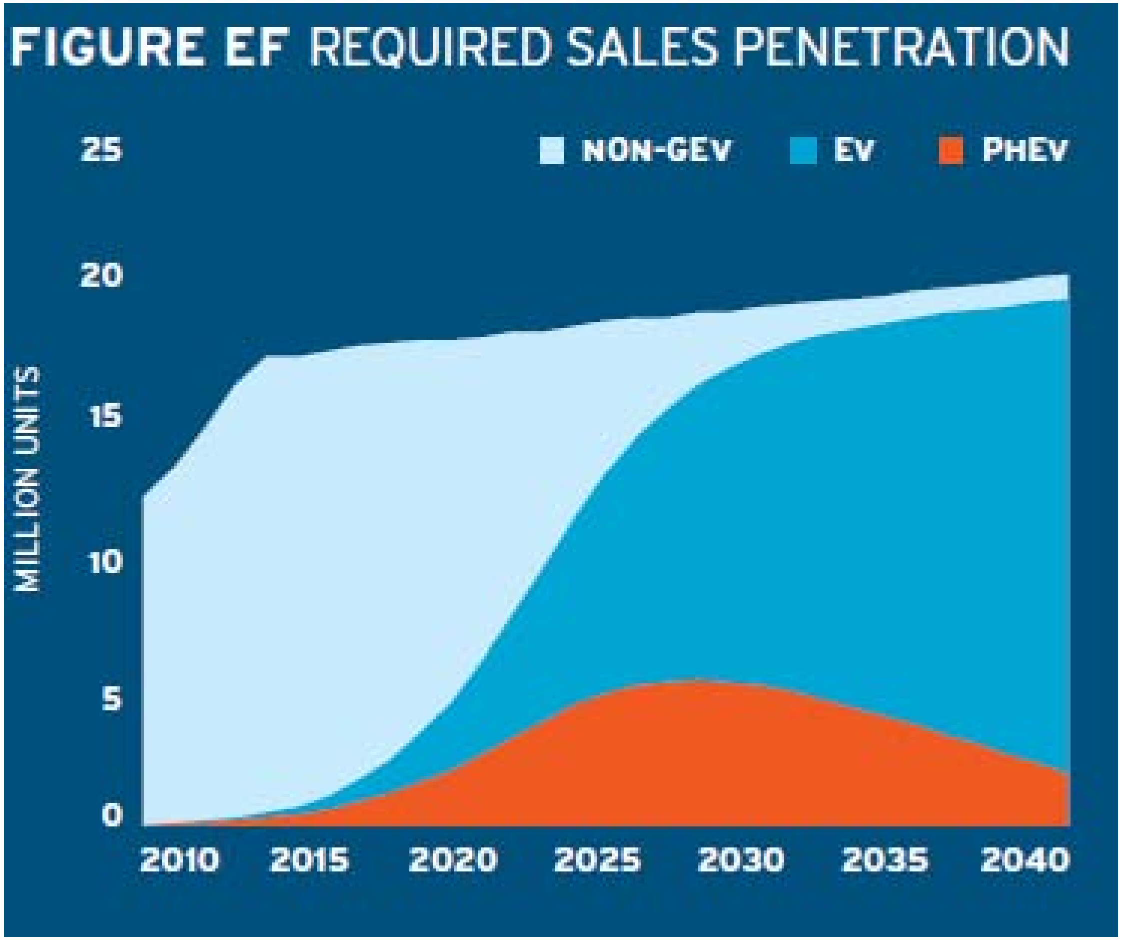
# Requiring an extremely rapid GEV fleet build-up





Source: EC Roadmap

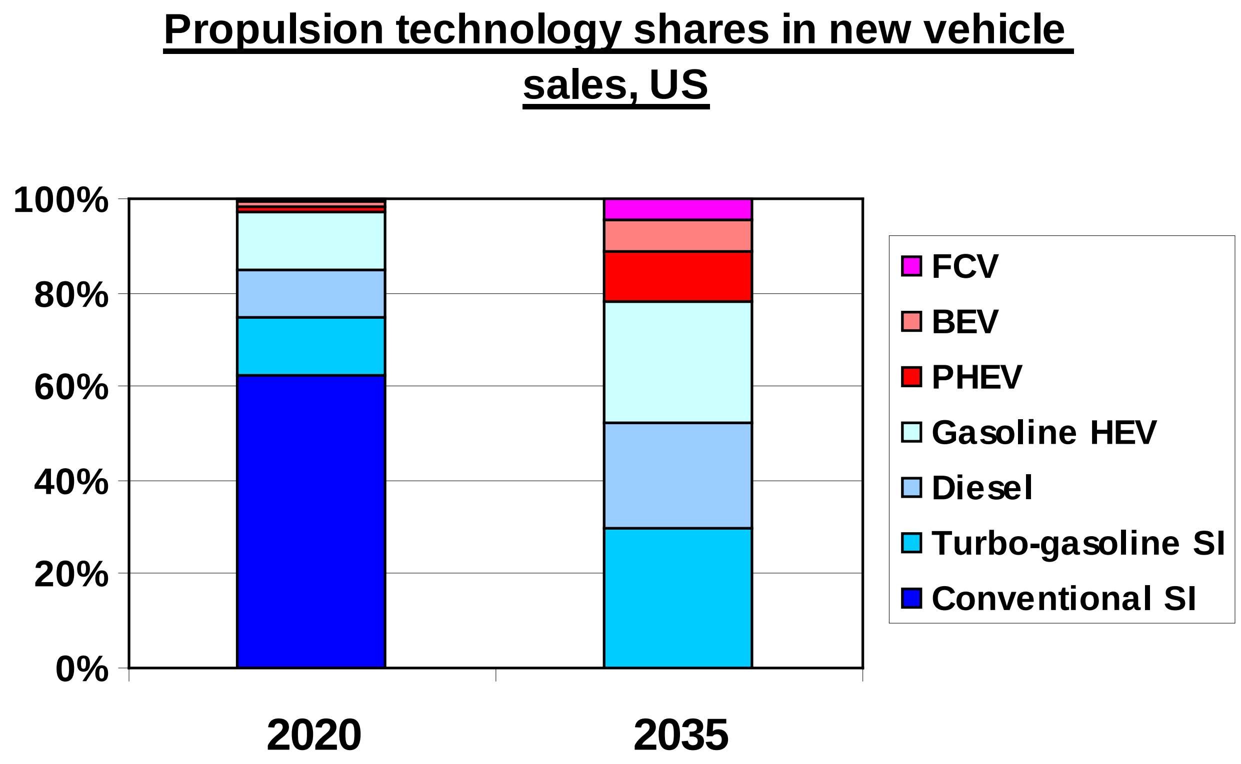
# And 90% of new vehicle sales to be GEV by 2030



# The real motivation is geo-political

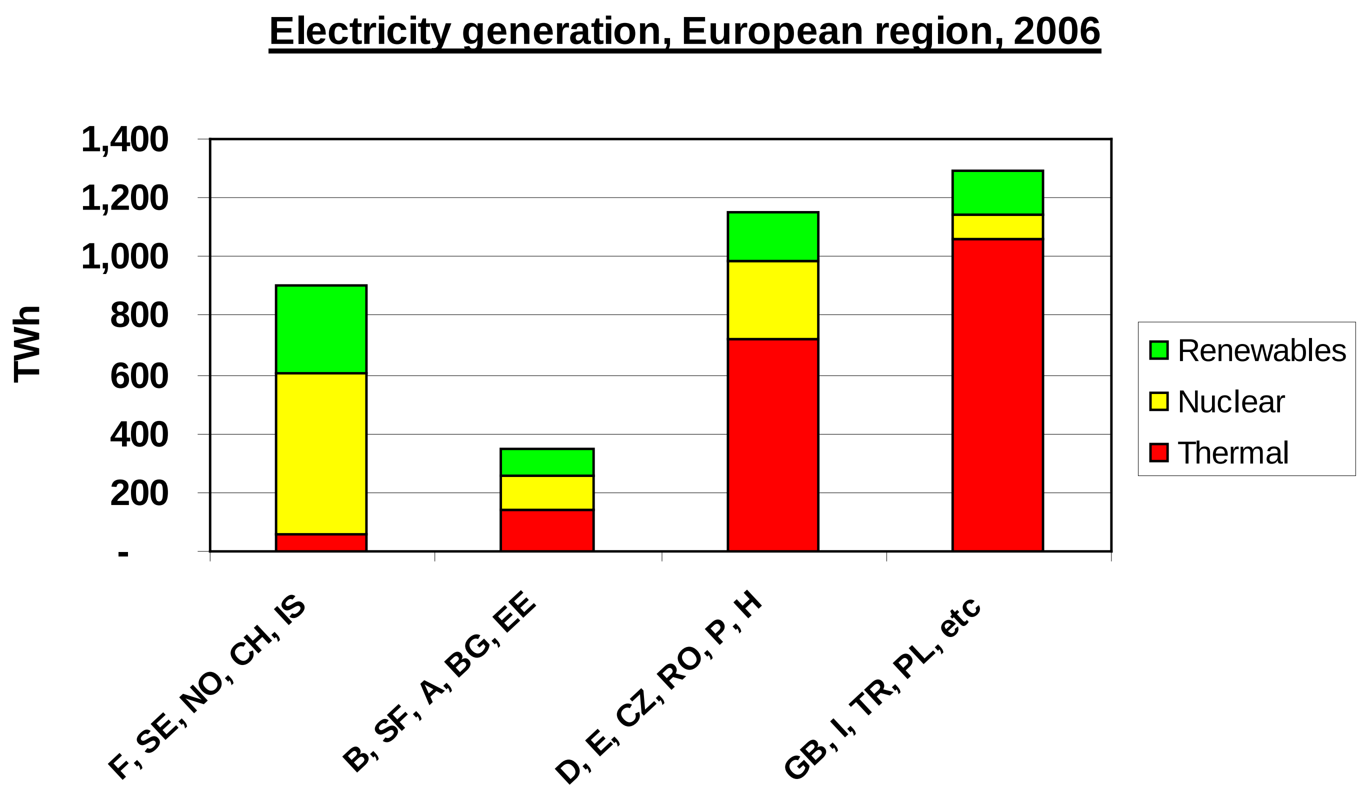
*Source: EC Roadmap*

# A more sober perspective



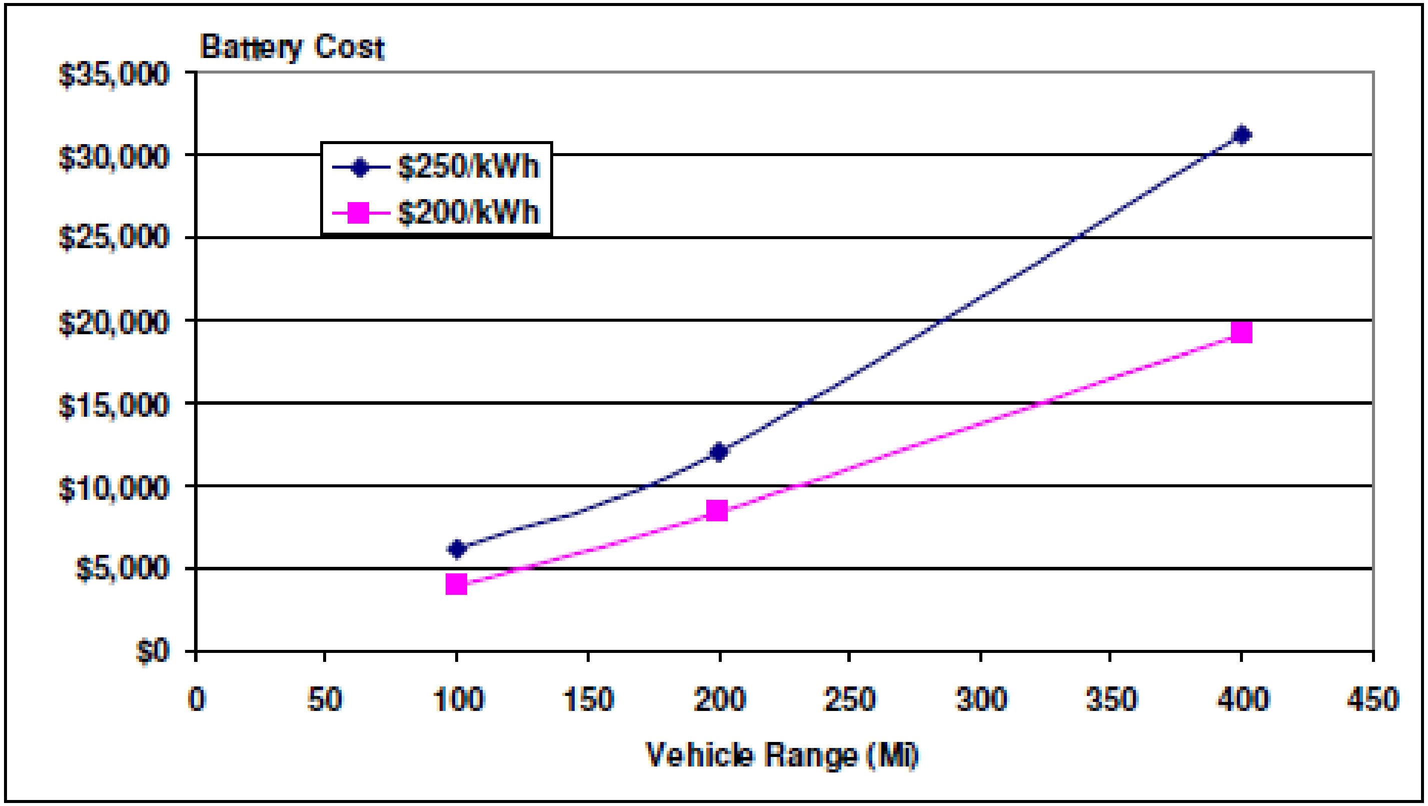

*Source: National Academy of Sciences, November 2009*

# Europe : "islands" of green electricity



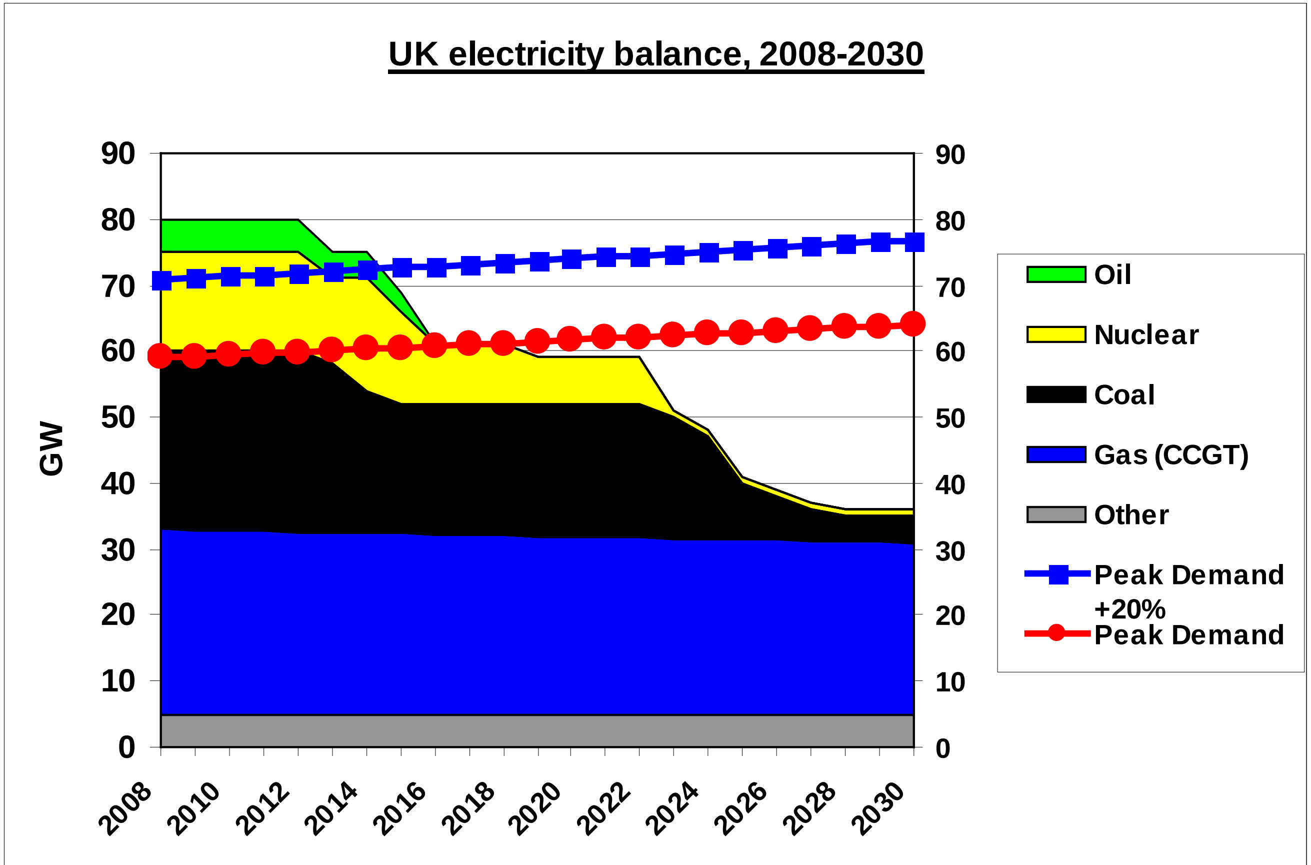

*Source: EU statistics*

# A huge cost hurdle



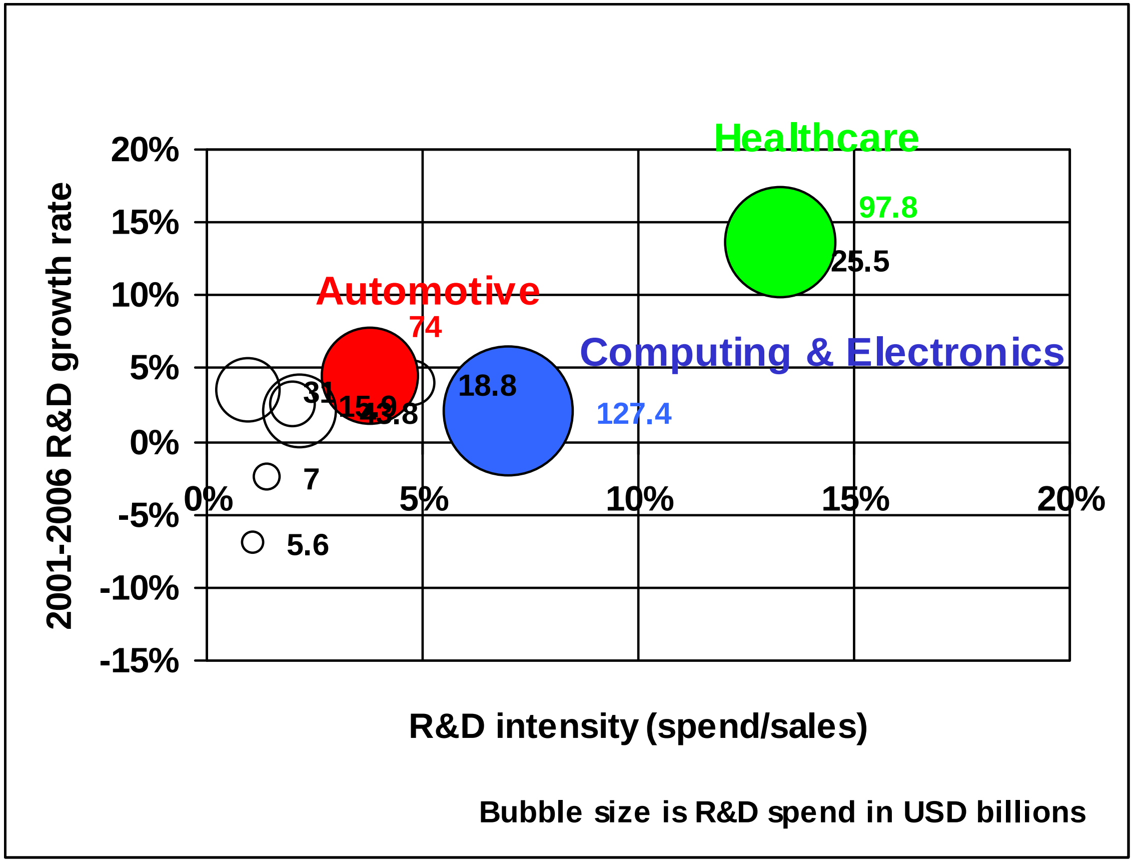

*Source: Kromer, MIT*

# UK: decarbonising electricity




*Sources: Eon, DECC, Times*

# A technologically conservative industry

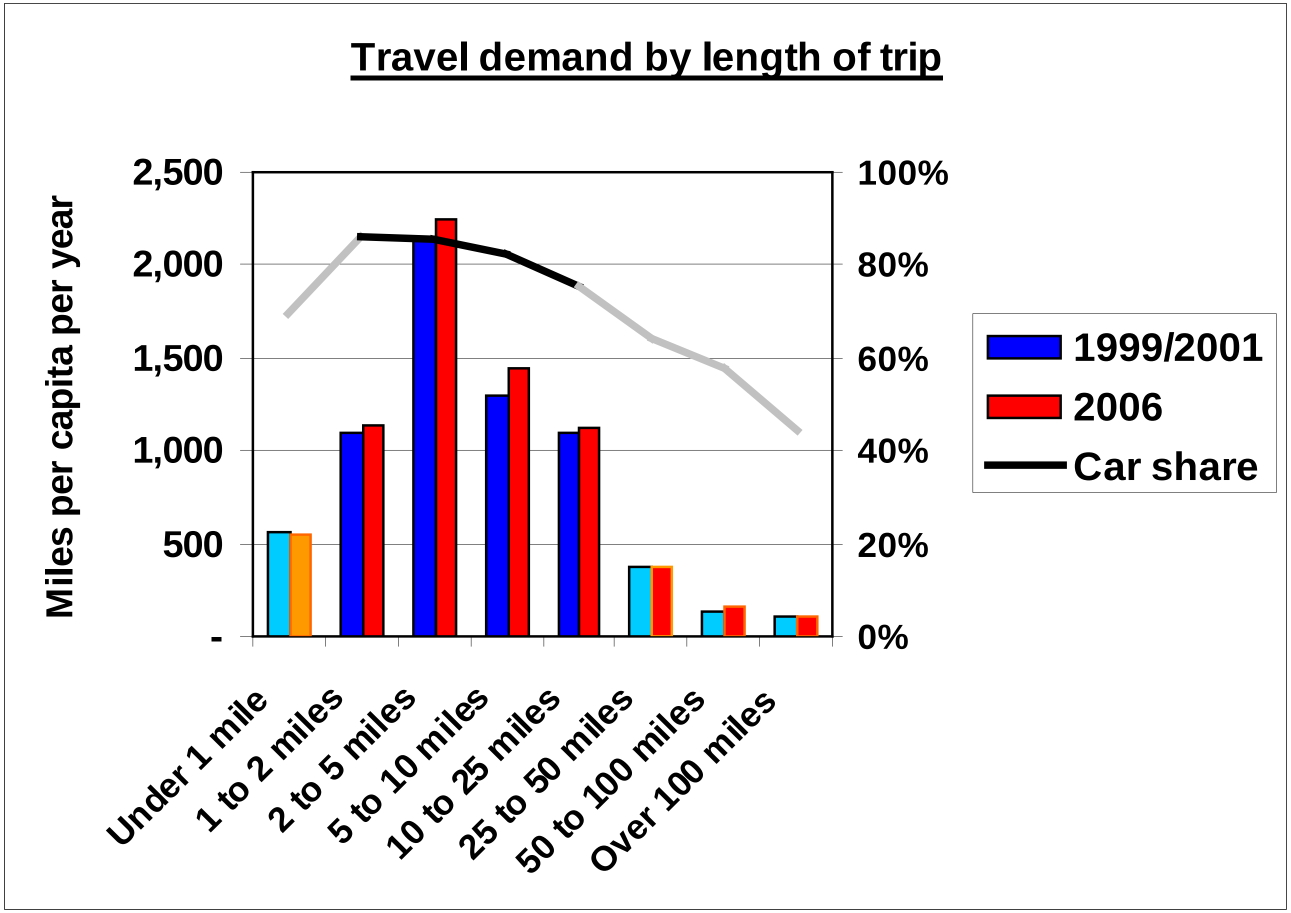



*Data source: Booz & Co*

# There is no significant market for Alternative Technology and eV vehicles today

- For a new market to emerge, one or other condition must be met
  - A set of users with an unsatisfied need
  - A better solution to an existing need
- Neither of these obtains today
  - 99% of car, LCV and HCV buyers are satisfied with the industry's current offering
  - The alternative solutions are not yet market-credible

# Work the demand side first

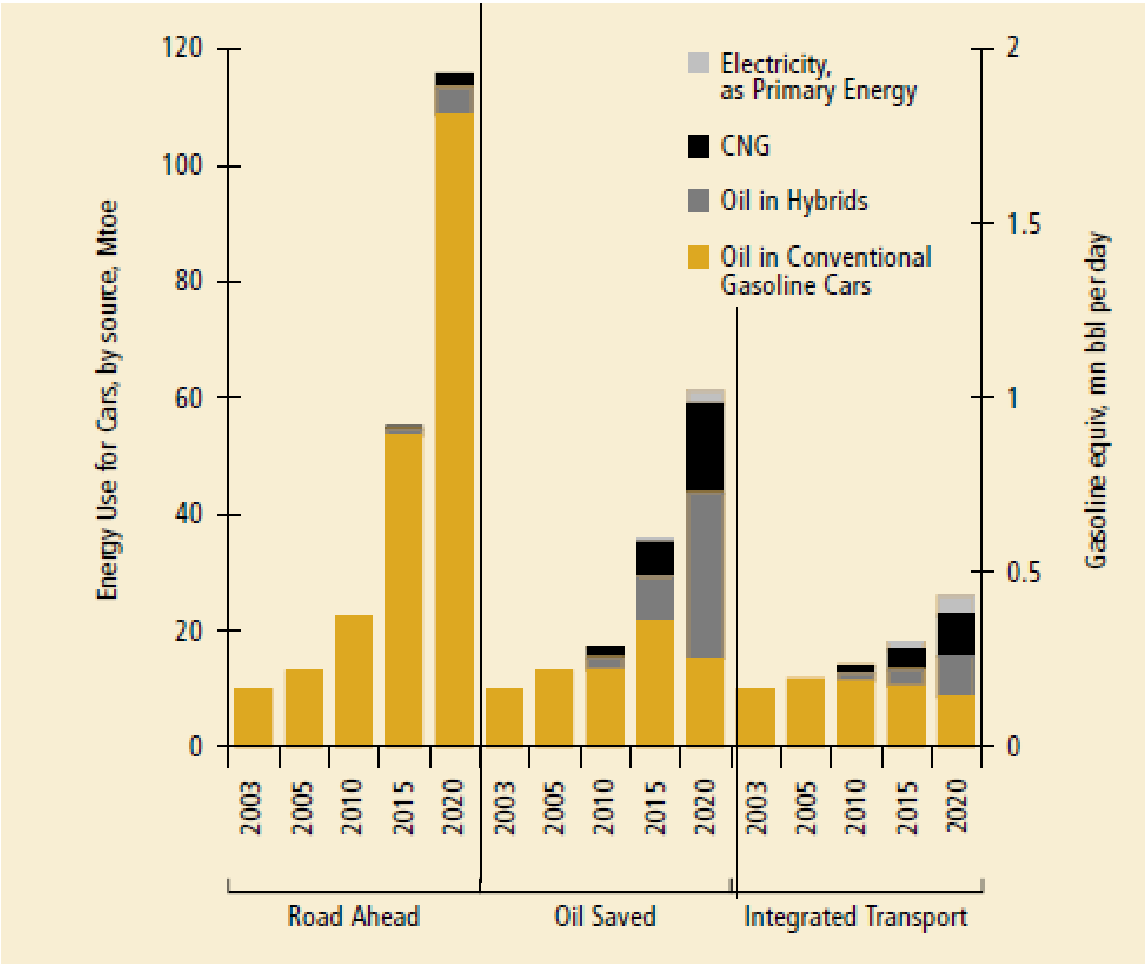



*Data source: UK Travel Surveys*

# Start with low technology risks

| | Now<br>100 | Stage 1<br>5-10 years<br>80 | Stage 2<br>10-20 years<br>50 | Stage 3<br>20-50 years<br>20 |
|---|---|---|---|---|
| **Vehicles** | | •Existing technologies<br>•Modest down-rating | •Strong specialisation<br>•New technologies | |
| **Mobility** | | •Small modal shifts<br>•Modest restrictions | •New transportation packages<br>•Planning & control | |
| **Habitat** | | | | •New habitats and habits<br>•Decoupling mobility from GDP |

# Might China lead the way ?




*Source: China Motorisation Trends, Wei-Shiuen Ng and Lee Schipper*