# Future Fuels and Environmental Impacts

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# Road Transport Impacts

- Air quality
- Climate change

- Land use and habitats
- Urban quality

- Security of oil supplies

# The UK Policy Context

- PIU Energy Review
- *Powering Future Vehicles* consultation
- Energy White Paper
- DfT analysis of biofuels and $H_2$
- Biofuels directive

# Oil Dependency in UK Transport

- >50% oil products by weight go to road
- Road (and air and water) almost 100% oil-based
- UK reserves in decline
  - will soon be a net importer

# Future Fuels

- Other fossil fuels
  - LPG, CNG
- Liquid biofuels
  - Methyl ester, bioethanol …
- Hydrogen
  - Compressed or liquefied

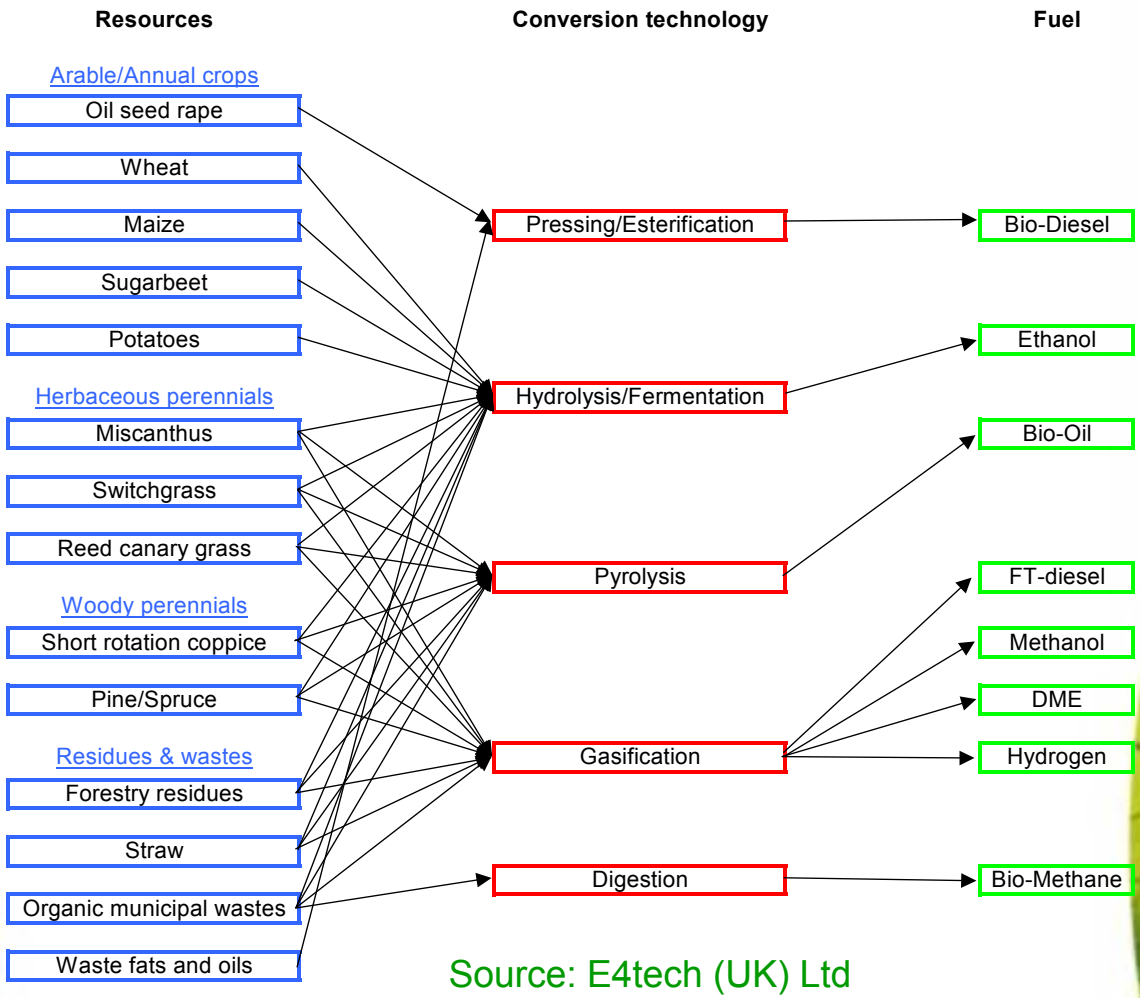
# Other Fossil Fuels

- LPG usually in LDVs
- CNG in HDVs (eg buses)
- Limited environmental benefit
- Costlier than conventional petrol and diesel
- Limited market?

# The UK Vehicle Fleet

- 29 million vehicles
  - 23m cars and taxis
  - 2m light goods
  - 0.5m heavy goods
  - 0.1m public service vehicles
- Alternative fuels
  - 250k LPG by 2004
  - 40k electric *et al*
  - All others petrol or diesel

# Products and Processes




Source: E4tech (UK) Ltd

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# Main Biofuel Sources

- Immediately available:
  - Annual crops
  - Waste oils and fats
- Longer term options
  - Herbaceous perennials
  - Woody perennials
  - Waste

# Feedstocks from Agriculture

- Biodiesel from oil
  - Rapeseed
  - Sunflowers
  - Palm and Soya
- Bioethanol from …
  - Grain
  - Sugarbeet or cane
  - Potatoes

# Perennial Feedstocks

- Herbaceous
  - Miscanthus
  - Switchgrass, etc
- Woody
  - Short rotation coppice (willow, poplar)
  - Other forest wood
  - Forest and woodland wastes

# Feedstocks from Waste

- Oils and fats
- Straw
- Forest wastes
- Organic municipal waste

# Processes

- Esterification
- Fermentation
- Gasification

- Others less relevant

# Greenhouse Gas Reductions from Biofuels

- Arable crop-based fuels
  - Some ghg benefit
  - Depends on agricultural inputs
- Fuels from waste or woody crops
  - Larger benefits
  - Technology not ready
  - Uncertainty over what is available

# Local Impacts of Energy Crops

- Biodiversity
- Landscape
- Air Quality
- Co-products / waste
- Water / soil
- Social / rural economy
- Local Characteristics
- Soil-nutrient fluxes C and N

# Factors Affecting Local Impact

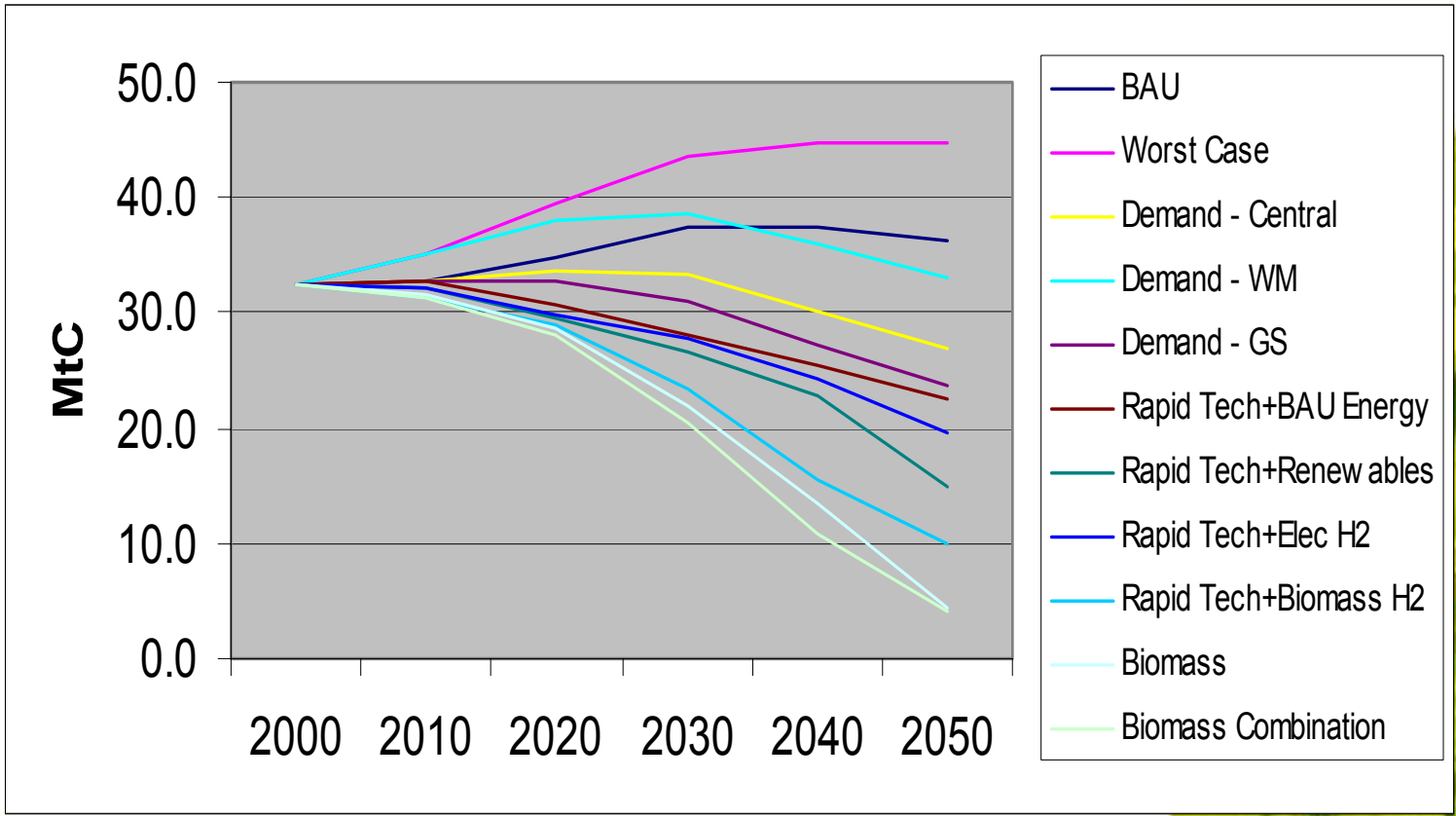
- Annual v perennial crops
- low vs high input (intensity issues)
- diversity vs homogeneity
- Scale of planting
- geographic / locational / regional

- Accreditation

# Renewable Hydrogen?

- Long term renewable electricity for hydrogen may well be the ideal, but
- In the short term, renewable electricity saves more carbon by displacing fossil fuels in electricity generation
- There could also be a strategic role for biomass (waste & woody crops)

# Carbon Outcomes



# Conclusions

- Reliance on petroleum can be substantially reduced
  - Vehicle efficiency
  - LPG, CNG probably marginal
  - biofuels could contribute – but how much?
  - Longer term shift to hydrogen or methanol
- Availability of renewables is key
  - Arable crops may be short-term option
  - Significant increase in renewable electricity
  - And/or waste and woody biofuels