Nick Vandervell
Company Secretary

Malcolm Watson
Technical Director

UNITED KINGDOM
Petroleum Industry Association Limited
9 Kingsway
London WC2B 6XF
Telephone: 020 7240 0289
Fax: 020 7379 3102
e-mail: nick.vandervell@ukpia.com
malcolm.watson@ukpia.com

By e- mail to king.review@hmtreasurygov.uk

20 August 2007

King Review Team
HM Treasury
1 Horse Guards Road
London
SW1A 2HQ

Dear Professor King,

UKPIA'S RESPONSE TO THE KING REVIEW OF LOW CARBON CARS

The UK Petroleum Industry Association (UKPIA) represents the nine companies engaged in crude oil refining in the UK and their related UK marketing activities. Our member companies supply most of the transport fuels and other oil related products used in the UK. As such, we have a major interest in measures to reduce greenhouse gas emissions from vehicles.

UKPIA and its members take seriously, the challenge of reducing greenhouse gas emissions from road vehicles. UKPIA is involved in a number of areas; for example active participation in the work of the Low Carbon Vehicle Partnership and the Commission for Integrated Transport's Climate Change Working Group. Our member companies are actively developing and/or deploying new technology which will reduce emissions of greenhouse gases such as first generation bio fuels, second generation advanced bio fuels, gas to liquids technology, hydrogen supply, renewables and refinery energy efficiency. In addition they are supporting a wide range of fundamental and applied research in a number of key areas.

UKPIA envisages reductions in carbon emissions from vehicles coming from a range of options, including new technology, bio-fuels, renewables (in the longer term), increased fuel economy and changes in consumer behaviour. Some of these options have been outlined in our publications such as *"Future Road Fuels"* (2004) and *"Delivering a low carbon economy"* (2005)

UKPIA's overall view of future transport fuels and technology can be summarised as:-

i) Medium Term to 2020

- Petrol and diesel supply the bulk of road transport fuels
- Continuous improvement in fuel economy by a variety of technologies, including greater use of petrol and diesel hybrids

- Limited penetration by alternative fuel technologies (bio fuels (mainly first generation), natural gas, hydrogen, methanol, LPG, electricity)
- Technology advances in some or all of Fuel Cells, Batteries, Bio fuels and Renewables – impossible to predict when and where breakthroughs will occur
- Gas to Liquids and Heavy Oil Conversion Technology improved to extend fossil fuel supplies
- Second generation bio fuels processes proved

ii) Longer Term to 2050

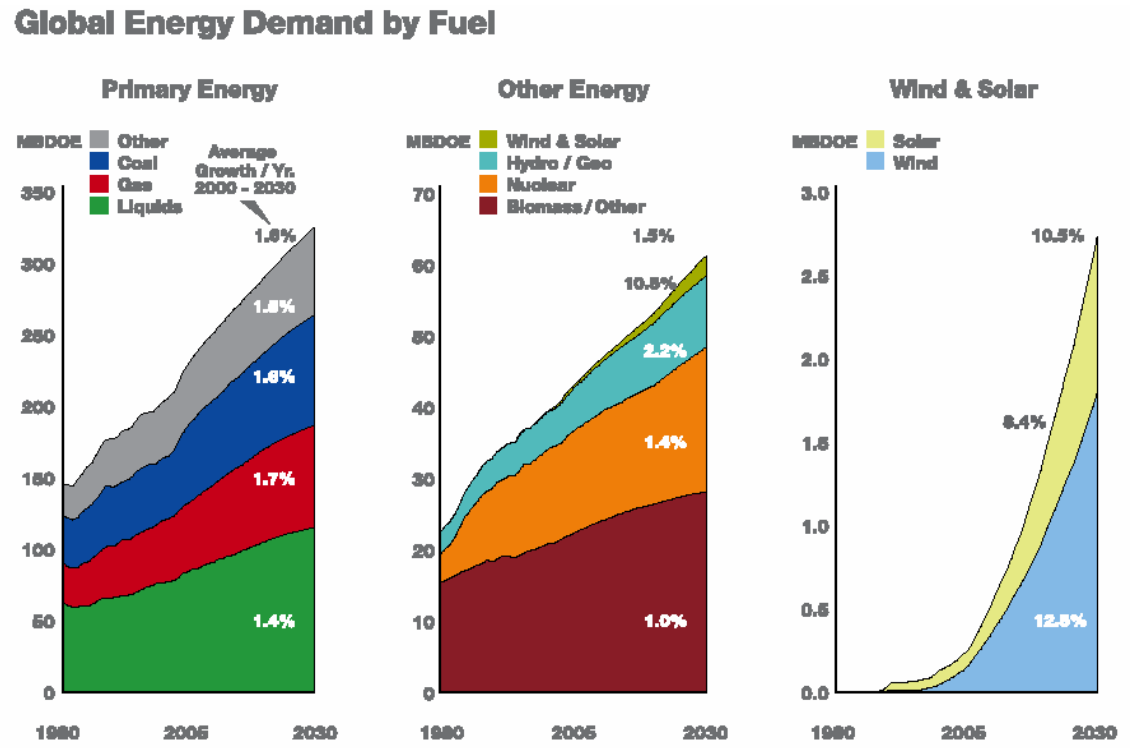
- Diesel and Petrol still in use from fossil fuels (crude oil, gas to liquids and heavy oil)
- Wider range of transport fuels in use
- Hydrogen seems front runner for the long term today but in reality no clear winner yet

Our more detailed responses to the specific questions posed are focussed on areas where we have specific knowledge or expertise.

Technologies and uptake

1. **Which are the transport-related technologies that, over a 25-year period, are most likely to deliver substantial reductions carbon emissions? What are the environmental and economic implications of these technologies?**

- The IEA predicts that oil will be the major source of energy in the world up to 2030 (the limit of their forecast). This is in line with other forecasts eg ExxonMobil's below:-



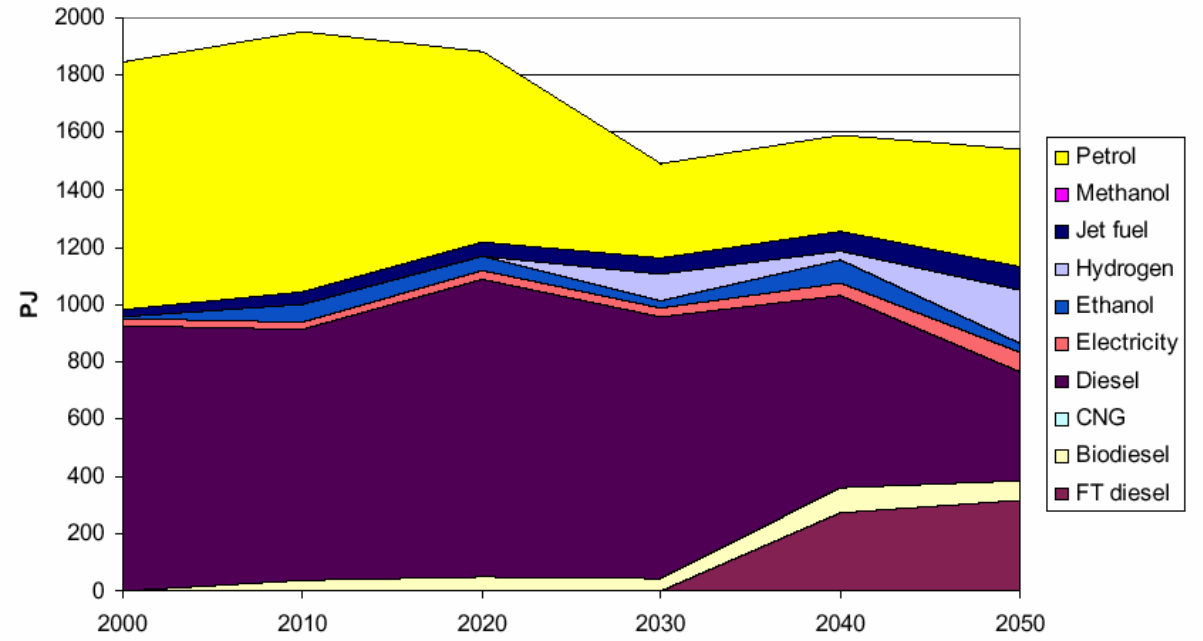
Source Exxon Mobil

- Transport fuels will remain the major use of oil (70%+) but other uses (petrochemicals and other speciality products, heating oil, lubricating oils, bitumen, etc) will remain important to both users and the economy.

- Post 2030, oil will continue to be a major source of transport fuels. For example the World Business Council for Sustainable Development's Report "*Pathways to 2050*" forecasts that fossil fuels will supply 60% of road transport fuels with hydrogen (25%) and bio fuels (15%) making up the balance.

- The Markal model used for the 2007 Energy White Paper gives a range of results for different scenarios for example:-

Markal transport fuel consumption 60% constraint case (M-C60)



- The average over a number of the Markal scenarios given below highlights there is still a significant role for petrol and diesel in 2050.

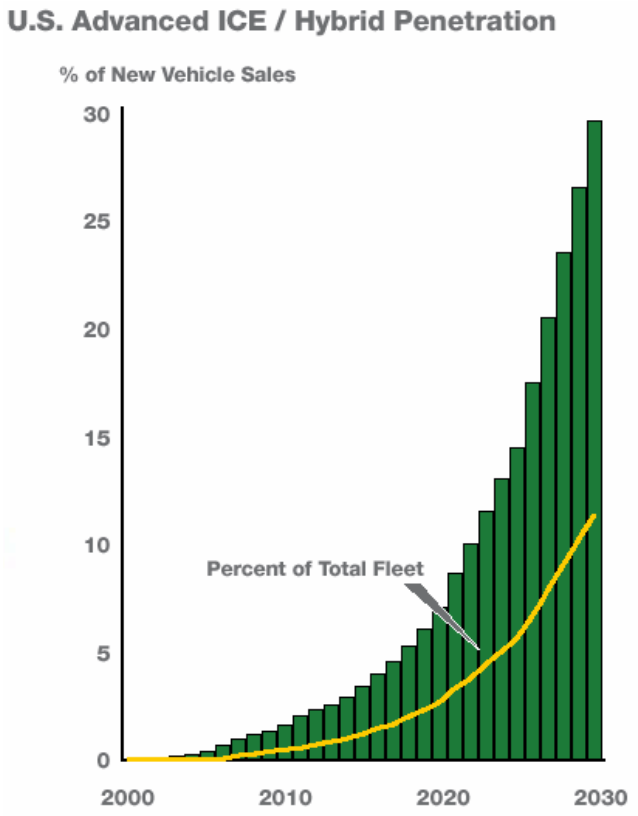
Average share of transport fuels in 2050 from Markal model over range of scenarios

Fuel	Predicted market share
Petrol	20%
Ethanol	**6%**
Methanol	**2%**
Diesel	26%
FT Diesel	**26%**
Bio Diesel	**5%**
Hydrogen	**11%**
CNG	**0%**
Electricity	**4%**

Greenhouse Gas Reduction Options

- Over the next 25 years liquid fuels will dominate the road transport market. These will predominately be fossil fuels (petrol and diesel) with limited penetration of bio fuels. Gaseous fuels will play a limited role until hydrogen / fuel cells are ready for the mass market (probably 2030+).

- Hence improving the efficiency of petrol and diesel powered vehicles is vital. This is likely to be a global target. For example ExxonMobil estimate (see below) that in 2030 around 30% of new light duty vehicle sales in the US will be fuel efficient advanced ICE or hybrid vehicles. In the UK/Europe this improvement will be driven by the successor to the Voluntary Agreement between the European Commission and the European, Japanese and Korean car manufacturers. At the same time the development of alternative fuels eg synthetic (Fischer Tropsch) diesel from biomass and hydrogen needs to continue.



- A variety of fuel and vehicle technologies have the potential to deliver a large reduction in greenhouse gas emissions. These need to be compared on a 'well to wheels' or 'field to wheels' basis and the most cost effective options encouraged, whilst maintaining a level playing field. For maximum effect these will have to be combined with changes in consumer behaviour and improved traffic management to deliver additional reductions

- The well to wheels emissions of most potential transport fuels were evaluated by the European Commission's Joint Research Centre, EUCAR (the European Motor Industry's research group) and CONCAWE (the European Oil Industry's research group). Their report is available at:- http://ies.jrc.ec.europa.eu/WTW . It covers:-

Fossil fuels	Petrol, Diesel, LPG, Natural Gas, MTBE
Bio fuels	Ethanol from sugar beet, wheat, wood, straw and sugar cane Ethers – bioETBE and Di Methyl Ether (DME) Biodiesel - FAME, FAEE from vegetable oils Synthetic Fischer Tropsch diesel from wood, coal and gas Methanol from wood, coal and gas Bio-methane from manure and municipal solid waste Hydrogen from wood

Hydrogen	Compressed and liquid hydrogen from natural gas and coal Compressed hydrogen from electrolysis powered by gas, wood, coal nuclear and wind
CCS	Carbon capture and storage with hydrogen and synthetic diesel from natural gas and coal.

- In the above report the fuels options that reduce emissions of greenhouse gases substantially (ie by 75% or more over petrol and diesel) include

Ethanol	From wheat when straw used for power generation, etc From sugar cane (Brazil) From straw or wood
Synthetic diesel (BtL)	From wood
Di Methyl Ether	From wood
Bio-methane	From manure or municipal solid waste
Hydrogen	From wood, nuclear and wind

- The production of synthetic diesel from wood (ie biomass to liquids or BtL), is at the process demonstration phase with the Choren plant in Germany due to start up in summer 2007. The plant will demonstrate the process and provide design information for the first commercial scale plant, which could be in operation by 2015. The major barriers to the widespread use of BtL technology include proving the technology, the high capital cost and establishing the necessary large supply of sustainable biomass. Cost information on BtL is available from the National Non-Food Crops Centre at Heslington near York. A similar timescale would apply to di-methyl ether from wood. Ethanol from straw would have a slightly shorter timescale but still needs to be demonstrated commercially.

- The production of biogas (bio-methane) from waste, etc is established technology. However the use of wood, wind, waste etc to generate electricity will in most cases give a greater reduction in greenhouse gases than conversion to road fuels. For example biogas can be cleaned up and compressed to 200+ bar for use in vehicles or as in most locations in the UK it can be simply burned to generate power. There is therefore a question over the best way to use the UK's renewable resources. Studies to date suggest the initial use should be in power generation to maximise the carbon reduction.

- towards the end of the 25 year time scale, we may see the emergence of hydrogen fuel cell vehicles but these are likely to be operating from a fixed base due to the cost and complexity of introducing a widespread distribution network for hydrogen re-fuelling. Extracting hydrogen takes a great deal of primary energy; this would have to be generated from a renewable or low carbon energy source (nuclear) or from fossil fuels with carbon capture and storage (CCS) in order to achieve a CO_2 reduction.

Environmental and economic implications

- most fuel and technology solutions have trade offs in terms of relative environmental impact and cost. In the case of conventional bio fuels, aside from variations in carbon savings associated with source material/processes, there are differing views about sustainability and impact upon food prices. The RTFO will include both carbon accreditation and sustainability reporting from April 2010 and 2011 respectively. In this respect UKPIA does not support setting ambitious targets for future bio fuel use in road

transport until the issues of sustainability and the potential impact on food prices have been fully addressed and effective sustainability reporting established.

- Second generation bio fuels eg from fermentation of pre-treated straw or gasification of wood, etc utilise a wider range of biomass material, give better quality fuels, offer advantages in terms of CO_2 reduction and do not displace food crops. However, at present they are relatively expensive and the technologies have not yet been demonstrated on a commercial scale. In this respect using biomass to produce heat and power offers a potentially greater CO_2 saving. (DEFRA Biomass Task Force report 2005)

- Diesel engined vehicles offer fuel efficiency advantages over petrol engines with a consequent CO_2 benefit. Technology improvements may narrow this gap. However the increase in the number of diesel vehicles has implications for NOx and particulate emissions.

- Increased diesel demand will also require UK refineries (in common with those in many EU countries) to address the growing imbalance between petrol (surplus) and diesel (deficit) output vs. demand, whether by substantial investment in new refinery plant (hydocackering units) or increased reliance upon imported diesel, mainly from Russia. (See UKPIA report '*Meeting our energy needs: the Future of UK Oil* Refining' and the Government commissioned report by Wood Mackenzie '*Review of UK oil refining capacity*' published with the 2007 Energy White Paper.

2. What applicable insights can be gained from past changes in vehicle technologies?

- Technological changes in vehicles and fuels tend to be evolutionary rather than revolutionary with new technology being proven in more expensive cars and then moving to smaller cheaper cars. At the latter stage small improvements in technology/cost can promote a 'tipping point' in terms of acceptability to consumers and subsequent uptake. However it is important to remember that not all technology improvements are commercially successful.

- Consumer acceptability and cost are critical. In relation to fuels, a good example is the switch to unleaded petrol in the late 1980s which happened slightly ahead of the general availability of new cars with 3 way exhaust catalysts requiring unleaded petrol. Take up was slow until the Government introduced a duty reduction. Likewise, the improved technical refinement of diesel-engined cars in recent years and the narrowing of the cost gap with petrol-engined equivalent models have promoted a substantial uptake from motorists.

- Fiscal and regulatory policy can do a great deal to encourage early adoption of technology eg leaded petrol, ultra low sulphur diesel, bio fuels, etc. However it is vital that government does not attempt to pick winners by favouring a particular technology with advantageous fiscal treatment. For example LPG was promoted with a large reduction in duty in 2002 as a means of improving air quality. This resulted in significant investment by motor manufacturers, oil companies and vehicle owners plus a large loss of revenue to the Treasury. However the air quality advantages over petrol engined cars were short lived and the duty incentive is now being reduced with a resulting collapse in the market. The initiative therefore had the effect of temporarily distorting the market rather than bringing about a permanent change.

- Any change to vehicle technology will take a long time to cover the whole car park so significant impacts on vehicle emissions will take time to be delivered.

- Gaseous road fuels (LPG and Natural Gas) needed large fiscal incentives to encourage a limited number of motorists to switch. This experience could be repeated with hydrogen.

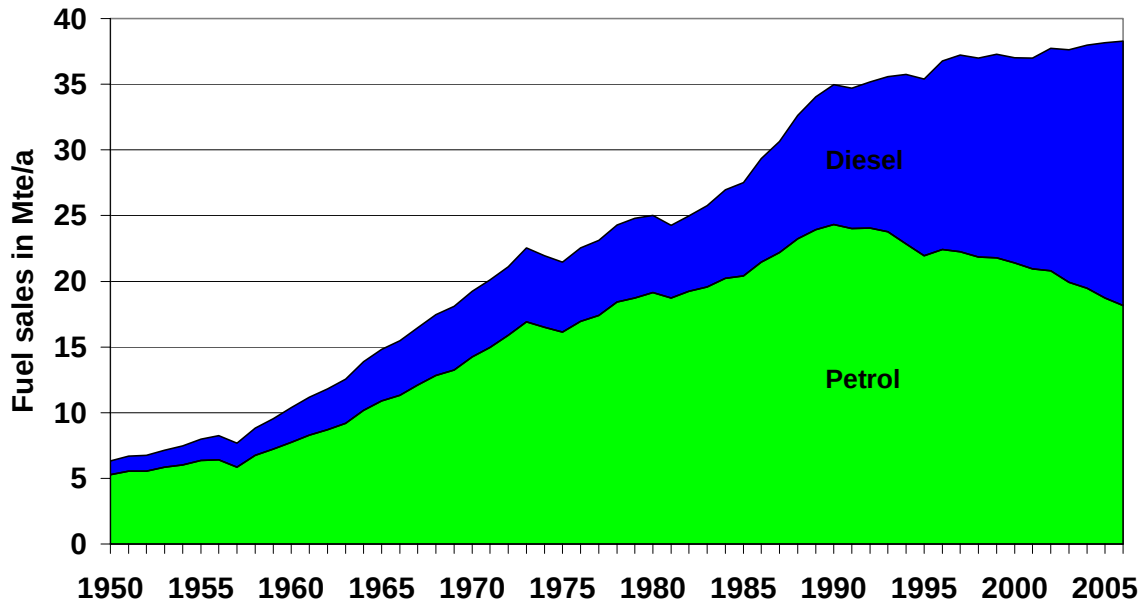
3. Looking out over this 25-year period, what visions are there for how vehicles and emissions will evolve? What will be the critical enablers and/or inhibitors for these particular visions?

Will the picture be similar globally, or for example, will the markets in the UK and the rest of Europe exhibit different characteristics from rapidly developing nations such as China and Brazil?

Historic

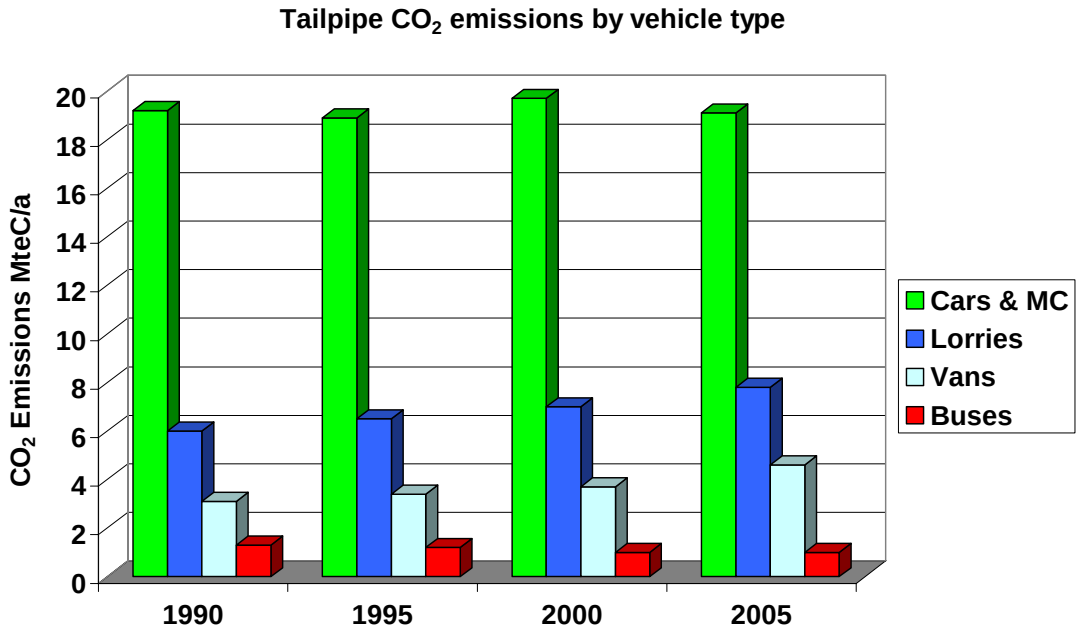
- It is apparent that in recent years the increasing demand for road fuels has slowed as vehicles have become more fuel efficient – see chart of petrol and diesel sales below.

Historic UK sales of petrol and diesel



Source DBERR

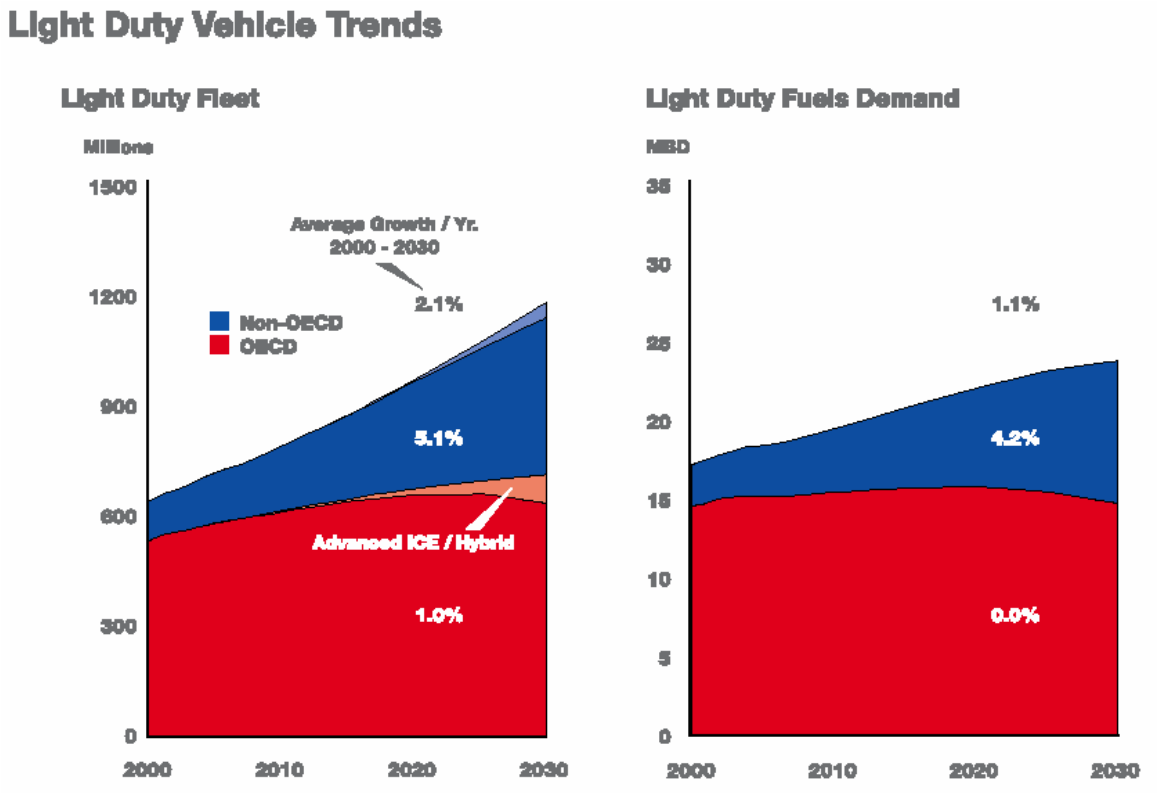
- For cars and buses there has been no increase in the tailpipe emissions of carbon dioxide since 1990 despite the number of vehicles on the road and the miles driven continue to increase – see chart below. For vans and lorries tailpipe emissions of carbon dioxide have increased. The overall effect is an increase of carbon dioxide from road transport of around 10% over the last 15 years. At the same time vehicle kilometres driven have risen by over +20%. With the move to bio fuels and a more effective replacement for the EU Voluntary Agreement the likelihood is that future emissions of carbon dioxide from road transport will fall.



Source DEFRA

Oil industry vision

Forecast of future light duty vehicle trends



Source ExxonMobil

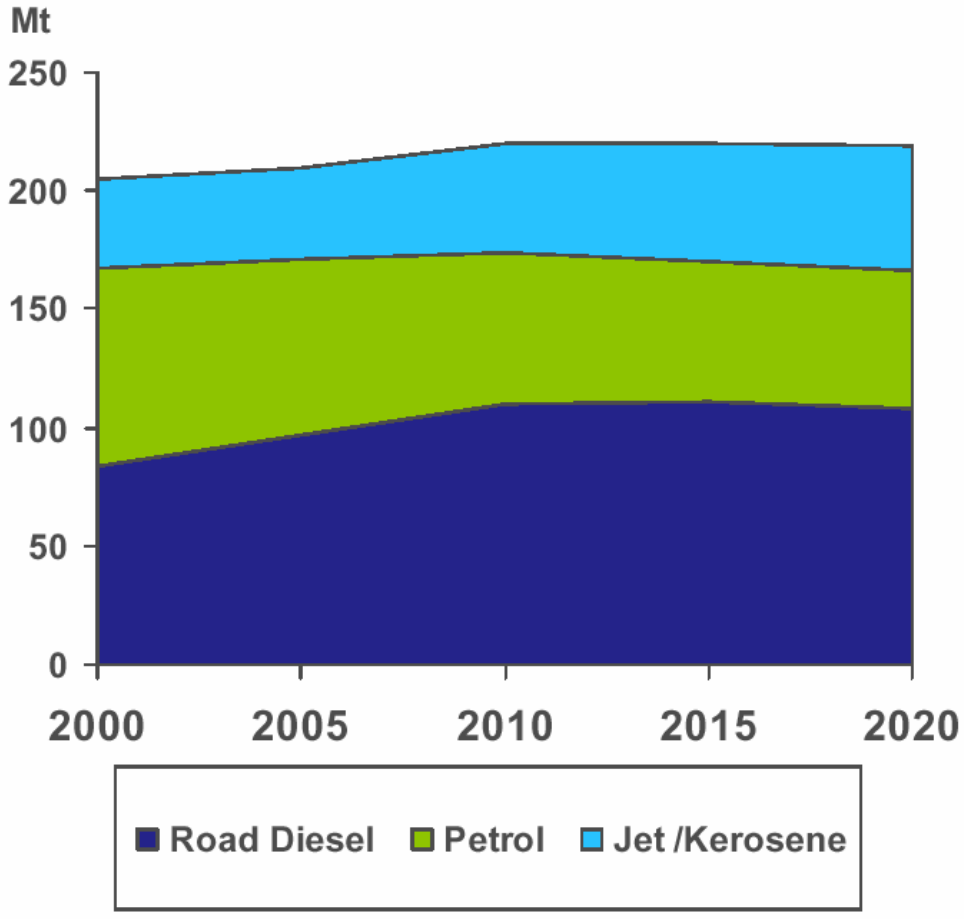
- ExxonMobil forecast by 2030, the number of light-duty vehicles on the world's roads will reach nearly 1.2 billion, close to double the levels of 2000. But increases in baseline vehicle efficiency and the penetration of advanced ICE/hybrid vehicles will help temper the rise in fuel demand. Fuel usage is expected to rise by only 1.1% per year on average through 2030. All of that gain is expected to come from non-OECD countries, where

tremendous growth in the number of vehicles more than offsets efficiency gains. Light duty fuels demand in OECD countries is forecast to remain essentially unchanged through 2030 as efficiency gains offset modest growth in the number of vehicles.

- In Brazil extensive use of bio fuels could reduce the overall carbon dioxide emissions from road transport. China is also active in bio fuels production

- For North West Europe, the Petroleum Consultants Wood Mackenzie (*Report to DTI for 2007 Energy White Paper*) forecast that the total demand for road transport fuels will fall marginally from 190 Mte/a in 2005 to 176 Mte/a in 2020. Specifically:-
  - NWE petrol demand is projected to decline from 83Mte/a in 2005 to 58Mte/a in 2020 due to rising vehicle efficiency, lower vehicle distances travelled and an increase in the number of diesel cars in the passenger car fleet.
  - NWE road diesel demand is projected to increase from 97 Mte/a in 2005 to 108 Mt/a in 2020 as a result of more diesel cars.

Wood Mackenzie forecast of North West European Transport Fuels Demand



Source: Wood Mackenzie, IEA

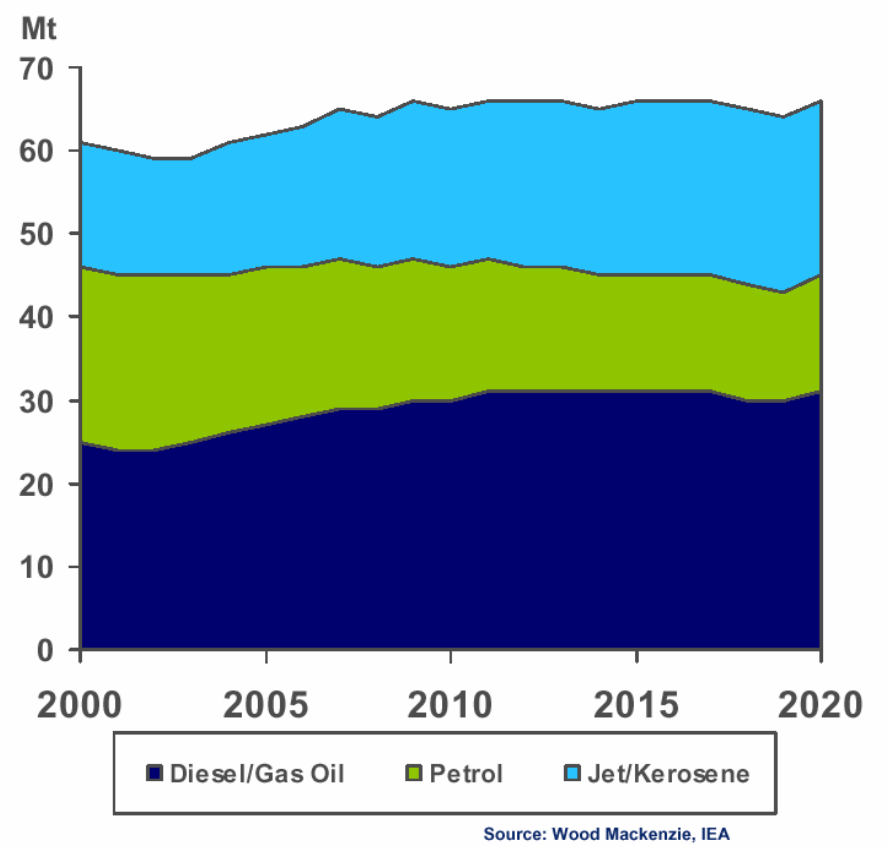
- This would result in a reduction in tailpipe carbon dioxide emissions by 2020 of around 7%. This figure would be increased by the planned use of bio fuels.

- For the UK, Wood Mackenzie (Report to DTI for 2007 Energy White Paper) forecast that the demand for road transport fuels will follow a similar profile.
  - Petrol demand is projected to decline from 18.7 Mte/a in 2005 to 13 Mte/a in 2020

- Road diesel demand is expected to peak between 2010 and 2015 at around 23-24 Mte/a compared to around 19.4 Mte/a in 2005.

- Wood Mackenzie's forecast would result in a small reduction in UK tailpipe carbon dioxide emissions. This figure would be increased by the planned use of bio fuels.

Wood Mackenzie forecast of UK petrol and diesel/gas oil demand



2050 Vision from External Modelling

- For cars, the Markal model runs for the 2007 Energy White Paper highlights hybrid technology and biodiesel are the major changes used to reduce CO_2 emissions with hydrogen only appearing at the end of the period (see figure below). The main messages are :-

  - It is clear that there is a continuing role for petrol and diesel even in a carbon-constrained system. This is at a much reduced level post 2020, with fuels being used in more efficient vehicles.

  - There is a move towards petrol and diesel hybrid vehicles from 2020 which significantly reduces any growth in transport final energy consumption.

  - Bio-fuels penetration is initially limited to that mandated under the (Renewable Transport Fuels Obligation (RTFO).

  - Bio-fuels play an increasingly important role post 2020, with the significant (20% of transport fuels) use of second-generation bio-fuels (synthetic Fischer Tropsch diesel (BtL)) in 2050. The levels of bio fuels are constrained by resource availability.

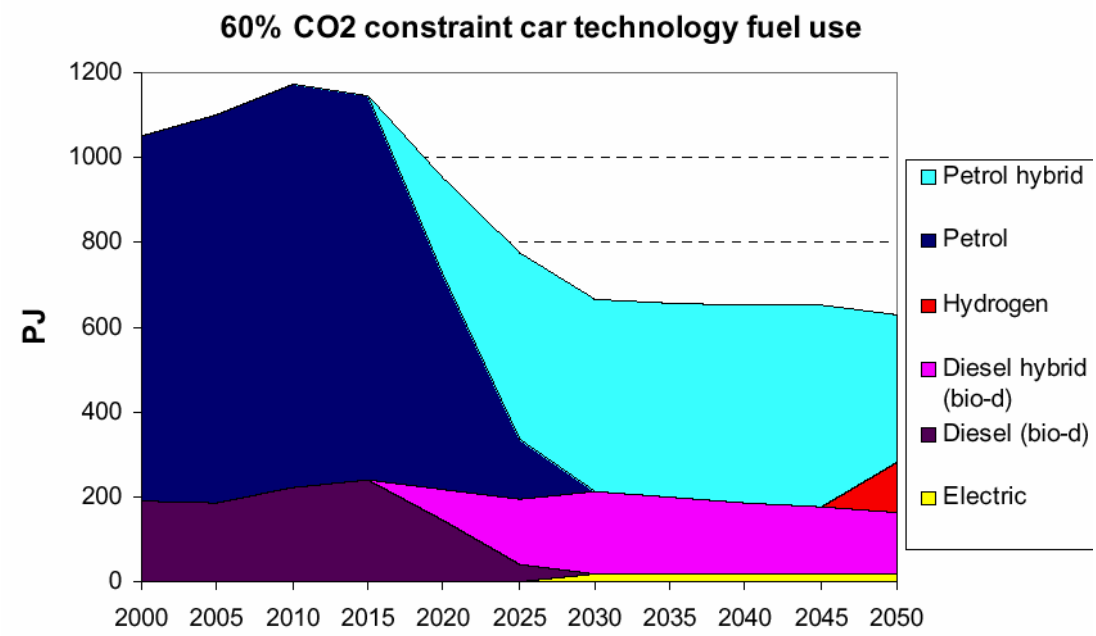
- In the restricted innovation cases, where limited progress on costs and technical performance mean that hydrogen is not taken up at all, synthetic Fischer-Tropsch diesel (BtL) is particularly important and ethanol also plays a bigger role, with the uptake of flex-ethanol vehicles.

- Post 2030, buses, then HGVs, and subsequently LGVs evolve into hydrogen vehicles

- Hydrogen production is carbon neutral in the carbon constrained cases.

- All modes transition through conventional, hybrid and onto hydrogen technology options, with the order of the hydrogen transition being, buses, LGVs, HGVs, and cars, driven by the infrastructure requirement to service these modes. Imposing an economy wide CO_2 constraint accelerates these transitions.

Markal future car technology for the 2007 Energy White Paper



- The major surprise in the Markal modelling is the low future demand for ethanol, which is already widely used in Brazil and the USA. Brazilian ethanol also gives a significant reduction in greenhouse gas emissions (-85%) on a field to wheels basis.

- Another key factor missing from the Markal modelling is any changes in consumer behaviour in response to both Government policy measures (fuel & road duty, congestion charging etc) and the likely increase in congestion, if road capacity increases do not keep pace with demand growth.

Global

- Globally vehicle and fuel technologies have tended to harmonise, especially in developed economies, but increasingly the same applies in developing economies which have growing aspirations to export their vehicles and reduce pollution. Hence UKPIA expects

the trend to more fuel efficient vehicles to be global. This will be accompanied by similar fuels standards.

- However, variations will occur in the timing between counties due to the different state of development, political priorities and the local environment for some alternative fuels. For example Brazil's early use of ethanol derived from domestic sugar cane.

4. Do you see any particular technologies dominating the UK and global markets or can we expect a mix of technologies to prevail? To what extent are both scenarios still open and what might be the implications of both?

- We see an evolving mix of technologies. It is difficult to forecast that any technology will dominate as they all have 'pinch' points eg resource availability for bio fuels and technology/cost for hydrogen. Liquid fuels are likely to continue to dominant up to 2050 and beyond, especially those utilising existing fuel distribution and storage infrastructure.

5. What are the infrastructure implications of low-carbon technologies, and how will these change with levels of uptake?

- Currently EU refineries produce a surplus of petrol and fuel oil which has to be exported. The EU is in deficit for diesel and jet fuel so imports are required to supplement EU refinery production. Wood Mackenzie predicts that these imbalances will get larger. It is anticipated that the oil market will cover the imbalances by investment in EU or non-EU refineries and the export of EU surpluses. Availability of clean petrol and diesel will therefore not be a barrier to the introduction of more fuel efficient technology in cars.

- The introduction of LPG on to forecourts in recent years highlighted the high up-front capital cost and technical issues associated with safe refuelling, as well as some issues surrounding 'retrofit' conversions of vehicles. The introduction was a success with strong market growth until the Government's announcement of reduced fiscal support stopped growth. On the other hand the introduction of natural gas was much less successful due to the high capital costs of natural gas service stations and the lack of natural gas vehicles.

- The LPG/natural gas experience give some pointers to the challenge associated with developing a hydrogen re-fuelling infrastructure, as hydrogen presents significant safety and handling issues. If hydrogen became a viable energy source in terms of cost and production using renewable or low carbon energy, the infrastructure cost would be enormous. It is likely therefore that the initial hydrogen fuelled vehicles would operate from a fixed base or within a defined network refuelling area. Some form of incentive may be required as most customers seem reluctant to buy alternatively fuelled vehicles unless there is a financial incentive to do so.

- Liquid fuels that can use existing distribution infrastructure and existing vehicles will certainly have a cost, practicality and ease of introduction advantages.

- Electric vehicles may become more commonplace in the urban environment. Even with developments in battery technology, regenerative braking, weight reduction, the range of such vehicles is likely to remain limited. As a result, overnight plug in charging at the vehicle base or roadside 'top up' at parking places is feasible and would help uptake.

6. Which segments of the car market offer the largest scope for achieving carbon reductions, either in terms of technology or consumer behaviour?

- UKPIA does not have specific expertise in this area but would like to see, wherever possible, consumer choice retained and market mechanisms used to deliver the carbon reduction desired, at the least cost to the UK economy.

- All sectors of the car market appear to offer potential for carbon reductions. A study by the SMMT showed that if consumers chose the most efficient vehicle in its class (whether small, mid-sized, people carrier, 4X4, SUV, sports), CO_2 reductions of up to 30% in comparison with the least efficient in class could be achieved.

- The greatest potential savings will come from influencing change in the most populous car sectors. However technology change in the car sector has usually been introduced via the more expensive, larger cars.

7. What in the more immediate term are the technologies that can help drive down carbon emissions?

- Incremental efficiency improvements, hybrids, first generation bio fuels generation, vehicle technologies eg:-

  - conventional bio fuel mixed with petrol and diesel capable of use across the whole vehicle fleet

  - a limited amount of higher proportion bio fuel mixes (B30 diesel and E85 petrol) in vehicles designed for this purpose is technically possible. However this will increase operating costs so the uptake is likely to be limited.

  - second generation bio fuels able to utilise a wider range of biomass eg straw to ethanol and synthetic (Fischer Tropsch) diesel from wood (BtL process). However both these processes have to be proved commercially before they can be widely adopted. Their process economics and infrastructure are likely to be challenging.

  - gaseous fuels such as LPG and CNG offer a small carbon reduction. However their use is likely to be limited.

  - high efficiency petrol engines utilising more complex electronic control of engine combustion/operation mode, compound turbo charging etc with possible narrowing of the economy gap between petrol and diesel engines.

  - more efficient and lightweight hybrid drive systems with lower frictional losses in transmission

  - diesel hybrid vehicles as well as petrol, with possible 'plug in' charging utilising electricity from renewable sources

  - weight reduction, low rolling resistance tyres and variable transmission for vehicles

- Consumer behaviour and more particularly consumer choice have a considerable impact, not least because a car may have a life expectancy of 12-15 years and most of the CO_2 emissions are associated with use rather than manufacture or end of life disposal.

- More efficient traffic management on congested routes

- Schemes to encourage car sharing etc

- Improved vehicle maintenance

- Training in driving in an economical manner has been demonstrated to be effective in commercial fleets so could be extended to all learner drivers

8. What are the complementarities and trade-offs between addressing carbon emissions and achieving our wider environmental objectives?

- Measures to reduce vehicle use and modal shift to public transport will also contribute to lower emissions of pollutants (PM_{10}, NOx, etc) as fewer kilometres are driven. Hence they will deliver reductions in both carbon dioxide and pollutants.

- On the other hand measures to improve fuel economy may not lead to a reduction in tailpipe pollutants as Euro emission standards for cars are set on a mass per kilometre basis..

- The increase in the percentage of diesel cars in the UK fleet has contributed to the improvement in the average fuel economy of new cars sold. This impacts sales of petrol and diesel which in turn affects UK refineries ability to meet diesel demand. It has also increased emissions of the pollutants PM_{10} and NOx.

- The main challenge will be developing a range of measures to reduce carbon emissions that do not harm the competitiveness of the UK or result in damage to prospects for the economy or employment.

- There may be benefits to the UK economy from being a leader in developing new low carbon technologies but in a global market for vehicles supported by existing R&D activity in the area it is not clear that the UK has a particular advantage.

9. What are the choices that consumers face now and in the future that can have an effect on their vehicle emissions?

- Vehicle choice in terms of fuel economy is critical, especially for new cars which will remain in the UK car fleet for 12-15 years. Tailpipe emissions are less critical as most cars aim to meet the same Euro emission standard.
- Vehicle use – adopting a non-aggressive driving style, obeying speed limits and reducing distance driven by use of public transport, walking, cycling or car sharing
- Living environment and proximity/access to work place and services
- Carrying out regular vehicle maintenance
- Following fuel economy tips – removing roof racks when not in use, keeping tyre pressures at the optimum level, etc

10. How might consumer demand very over time and what are the implications of this?

- Consumer demand for mobility is expected to increase over time with increasing spending power, total population and households.

- Demand for fuel for cars in the UK is likely to slightly decline over the next 15 years with the fall in petrol consumption largely offset by a rise in diesel consumption as the motor manufacturers push diesel powered cars – see response to question 3. In the longer term some of the demand for petrol and diesel will be replaced by a mixture of other fuels.
- Cost and congestion could reduce the rate of increase but research indicates that consumers are unwilling to forego the convenience of their cars unless the alternatives are attractive in terms of convenience and cost.

11. What are the interactions between UK and international markets, both in the development and uptake of vehicle technologies? What are the implications of this?

- no comment.

12. How strong are UK capabilities in the relevant product and technology areas, from the research base through to design

- no comment.

13. What are likely to be the major inhibitors of the implementation/uptake of low carbon vehicle technologies?

- For fuels, supply and production infrastructure, particularly for new gaseous fuels
- Public acceptance, particularly performance and reliability of new technologies compared to mature technologies (e.g. how will a 2030 fuel cell vehicle compare to a 2030 diesel vehicle of similar size?)
- Residual values of alternatively fuelled vehicles
- Lack of consistency in Government policy

Role of Government

14. To what extent does the Government's role in respect of low-carbon technologies need to be technology-specific and to what extent is a solution-based approach more desirable?

- The Government should avoid technology specific solutions. A technology neutral, solution based approach should be adopted.
- In the longer term, any wholesale switch of fuels and technologies, once clear advantages are demonstrated, will need significant support form the Government, as there will be large barriers to overcome, particularly with regard to refuelling infrastructure. However, the UK's track record of 'picking winners' is not impressive and for this reason technology development should largely be left to the market.

15. What does the history of current technologies tell us about the appropriate role for government?

- History tells us that when the UK Government and the EU set sensible targets and frameworks with appropriate prior consultation, then the oil industry and car manufacturers can deliver. This was demonstrated with the Auto-Oil approach which set Euro tailpipe emission standards.

- Policy indicators must be long term as the timescale and amount of investment to adapt to change are considerable in both the fuel supply and the motor industry

- It is also important to have clear targets for deliverables from the separate industries, motor and fuel, rather than a shared one across both industries.

16. What is your assessment of the effectiveness of current UK Government policy in respect of promoting low-carbon technologies?

- UKPIA has not assessed the impact of Government policy.

17. Do you think that there are any significant barriers or market failures that substantially hinder the ability of the market to deliver the best outcomes for the UK?

- No comment

18. What do you think should be the priorities for UK government policy in respect of low-carbon vehicle technologies? What are the best outcomes for the environment and the UK economy, and how can these best be achieved?

- UKPIA believes that the priorities should be set on the basis of adopting the most cost effective options first.

- There may be some advantages for the UK economy but this is far from certain given the global scale of most key players.

- UKPIA believes that to maximise the advantages to the UK economy the King Review should recommend :-

  - A single, high level focal point responsible for all aspects of HMG's low carbon vehicle policy and its implementation. This will ensure that the policy is joined up and delivers the policy objectives for the short, medium and long term.

  - Set clear, long-term targets so the market can deliver rather than picking a particular technology 'winner' or 'winners'. Targets should be achievable and evidence based.

  - Emphasis the need for a stable regulatory & fiscal regime and a consistent long term policy framework to allow manufactures, fuel suppliers and the supporting industries to make the necessary investments.

  - Recognise the long term importance of oil derived road fuels in the short, medium and long term.

  - Work with key sectors of industry to establish how the Government's target of decarbonising UK road transport can be delivered in the short, medium and long term. UKPIA and its members are happy to work with HMG on behalf of the oil refining industry.

  - Recognise that the UK motor and fuel industries are mainly part of groups that operate on a global basis so will seek low carbon solutions on a global basis.

- Recognise consumers' strong desire for mobility and resistance to change.

- Carry out cross-sector analysis of greenhouse gas reduction options to identify the most cost-effective way of reducing greenhouse gas emissions, check finding with the relevant industry and then implement the most cost-effective options first.

- Establish the best use of the UK's renewable and biomass resources – electricity generation and/or transport fuels

19. What are your views on the effectiveness of regulation and what forms of regulation are most appropriate?

- Provided it is achievable, regulation and policy can have a significant influence, as demonstrated by the EU Directives on fuels and exhaust emission standards arising from the Auto-Oil programmes.

- However, as explained above, it is desirable for regulations to be consistent with long term policy, preferably set with prior consultation, and applied on a consistent basis.

- Reductions in CO_2 and other greenhouse gas emissions will have to be made across all sectors, but bringing about change in the domestic sector and with consumers generally represents a challenge, particularly with personal transport.

- Emissions Trading Schemes (ETS) have a role to play in reducing CO_2 emissions since they direct capital in the economy to the point at which it can most effectively be applied to mitigate emissions. An efficient market requires the holder of the allowances to be both the emitter and the party capable of taking action to mitigate emissions by investment or trading of allowances. Hence the application of the EU ETS to large energy intensive plants.

- It has been suggested that ETS could be extended to other sectors, including aviation and surface (ie road) transport. Whilst extension to the aviation sector is feasible, since airlines are 'fleet operators' with some flexibility over choice of aircraft, the mode of operation and can influence other factors giving rise to emissions, the same is only true of road transport if it is applied on to an individual motorist.

- Applying the EU ETS to millions of individual vehicle owners would be complex and costly to operate/police. Hence several studies have suggested moving the onus on to fuel suppliers. This would breach the principle of ETS as the holder of the allowances (the oil company) has no direct operational control of the choice of vehicle or the way it is driven. This approach would deliver no more benefit from reduced CO_2 emissions than an equivalent increase in road fuel taxation- but administration cost would be increased.

20. What can we learn from international approaches to promoting the development and uptake of low-carbon vehicles?

- Fuels - The European experience, for example in Germany and Sweden, has tended to concentrate on fiscal incentives to encourage the uptake of alternative fuels. Fiscal incentives may have a role to 'kick start' change but are not a long-term solution as the cost becomes too high for the Treasury in the long term.

- The UK approach with the RTFO is to move to an obligation and associated buy-out penalty on fuel suppliers failing to meet the obligation, which ultimately moves any additional cost directly to consumers rather than indirectly via taxation. The RTFO approach should minimise the overall cost to the consumer.

21. How can we seize the opportunities for UK businesses and for inward investment resulting from an increased demand for low carbon vehicle technologies, both domestically and internationally?

- Focus on measures that have global application.

Finally, the oil industry is highly competitive, complex, capital intensive and invests for the long term. Any business decision to develop alternative fuels in the UK depends on the UK being perceived as an attractive place to invest in. Government policy needs to encourage this investment.

Thank you for involving the oil industry in the consultation process. If you believe that UKPIA can be of help to you in any way please do not hesitate to contact us.

Yours sincerely

Malcolm Watson
Technical Director
UKPIA

Nick Vandervell
Company Secretary
UKPIA