

# The King Review of low-carbon cars

## Call for Evidence

### Annex 1: questions

It would be helpful if representations could be made in response to the following suggested questions. Please address whichever questions are relevant to your areas of experience and knowledge and add additional comments or attach further documents where appropriate.

#### *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?
2. What applicable insights can be gained from past changes in vehicle technologies?
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?
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 each?
5. What are the infrastructure implications of low-carbon technologies, and how will these change with levels of uptake?
6. Which segments of the car market offer the largest scope for achieving carbon reductions, either in terms of technology or consumer behaviour?
7. What in the more immediate term are the technologies that can help drive down carbon emissions?
8. What are the complementarities and trade-offs between addressing carbon emissions and achieving our wider environmental objectives?
9. What are the choices that consumers face now and in the future that can have an effect on their vehicle emissions?
10. How might consumer demand vary over time and what are the implications of this?

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?
12. How strong are UK capabilities in the relevant product and technology areas, from the research base through to design, development and delivery?
13. What are likely to be the major inhibitors of the implementation/uptake of low carbon vehicle technologies?

*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?
15. What does the history of current technologies tell us about the appropriate role for government?
16. What is your assessment of the effectiveness of current UK Government policy in respect of promoting low-carbon technologies?
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?
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?
19. What are your views on the effectiveness of regulation and what forms of regulation are most appropriate?
20. What can we learn from international approaches to promoting the development and uptake of low-carbon vehicles?
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?

*Other comments or issues*

Please add comments and/or attach any documents you wish to submit as evidence.

## KING REVIEW OF LOW-CARBON CARS

### COVER SHEET FOR RESPONSES

| Contact details of respondent |  |
|-------------------------------|--|
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Please mark a cross below against the questions covered by your response. Not all issues will be relevant to all respondents – please feel free to skip questions that are not relevant to you.

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Have you raised any other issues in your response?

Yes

**Details of accompanying documents** (Please continue on additional sheet if necessary)

See attached covering letter and response

Place a cross in this box if you DO NOT want your response to be made publicly available.

**Representations should be sent, preferably via email, to [king.review@hm-treasury.gov.uk](mailto:king.review@hm-treasury.gov.uk) or, via hard copy, to Miss Mel Rich, King Review Team, HM Treasury, 1 Horse Guards Road, London SW1A 2HQ. Contact telephone 020 7270 6391.**

The deadline for responses is 20 August 2007.

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

20 August 2007

Dear Miss Rich

### **The King Review of Low-Carbon Cars**

The response by the Institution of Mechanical Engineers to the King Review of Low-Carbon Cars is enclosed

This Institution recently held two events specifically aimed at facilitating an authoritative response to the King Review, the first of which, entitled The Carbon Challenge, was held in London on 4 July 2007 when the 80 delegates discussed emissions from transport and the technologies required to reduce them. The outcome from the road transport sector has been included in this response. The second event, an experts meeting of invited delegates from the automotive and fuels industries, academia and research was held on 18 and 19 July in Buckinghamshire, and this directly addressed the questions posed in the Review. Details of this event and the list of delegates is contained in the annex.

In general it is considered that change will be evolutionary although at an increasing rate and that liquid fuels will continue to dominate as the main energy source. The average size of car will reduce, there will be an increasing number of hybrid electric vehicles for certain applications and improved vehicle technologies and driver aids will yield significant emissions reductions.

However, throughout the various debates on these issues it was apparent that in the short and medium terms societal change has the greatest potential for reducing emissions from transport. All the foreseeable technical advances will not halt the rate of increase in emissions unless accompanied by a change in societal conscience and behavior.

In the long term fuel cell technology using alcohol based energy sources is expected to displace liquid fuels but it will be even longer before hydrogen provides a viable energy source in the UK

All of the data quoted in this response has come from previously researched and published material and the opinions are consensual.

Yours sincerely

John Ling  
Head of Transport

# **KING Review Response from the Institution of Mechanical Engineers**

## **Question 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?

## **Answer**

### a) Short term

- a. i) The liquid fuel industry and its accompanying huge infrastructure is well established and very efficient and any displacing technology would find it difficult to compete. Therefore alternative sustainable liquid fuels are likely to be more ready substitutes for fossil fuels either by dilution in the first instance but eventually to totally replace them. Currently E85 ethanol is generally used despite its transportation problems that force it to be terminally blended. There are political drivers for the use of ethanol and current subsidies make a sound financial case although there are ethical issues and an environmental cost of conversion. Methanol is not considered to be a short term solution except perhaps in areas such as China where readily available coal to use as a feedstock might make commercial if not environmental sense.  
Ethanol, alcohol, butanol based additives are the likely alternative fuels with alcohol being preferred due to higher calorific value. There is considerable ongoing research into Biofuels both in the UK and internationally and the long term commercial incentives are enormous. BP alone has invested \$500M in the USA.
- a. ii) Evolutionary improvements in powertrains (smaller engines with superchargers to control power actually required will become the norm)
- a .iii) Advanced vehicle technologies – regenerative braking, energy recovery
- a. iv) Weight reduction, improved aerodynamics and reduced mechanical friction.  
Increased use of variable thickness materials, particularly plastics reinforced with sustainable organic fibres (the emissions generated in converting fossil fuel to plastic are less than when burned as fuel in vehicles). Mass has an effect on overall vehicle performance but this is not a linear relationship. Halving the mass of the vehicle would only result in a 15% fuel efficiency improvement. The benefits of weight reduction are mainly realised in the urban cycle
- a. v) CNG is used widely for public service vehicles in India and there has been a large scale conversion of vehicles in Iran with some enormous infrastructure difficulties now largely overcome. With copious supplies of natural gas this is a viable option, but with the UK's dwindling domestic supply the use of this technology can be discounted (Current domestic natural gas supply is 3M tonnes

oil equivalent which is predicted by Government to reduce to between ½ M and 1M oil equivalent by 2030)

a. v) Hydrogen fuel cells will only be a viable technology in the long term and will require significant ongoing investment. It is likely that fuel cell development will be evolutionary, with energy sources other than H<sub>2</sub> being more realistic in the medium term. Latest developments feature methanol and metal hydrides. There is also a “chicken and egg” situation between the infrastructure to provide H<sub>2</sub> and the production of fuel cells. Until an H<sub>2</sub> fuel and distribution infrastructure is in place investors are reluctant to commit. Another important factor is that car companies would prefer not to transport H<sub>2</sub> in any form until all of the technical solutions have been solved. The UK lost an early lead in fuel cell technology to Germany and the USA, however, there are still opportunities to lead in solving some of the key long term enablers such as the development of materials that will allow secure transfer and storage of H<sub>2</sub> and the development of alternative fuel cell energy sources. The market for such products will be huge as it will not only be applicable to transport but will embrace multi use power packs for uses such as boilers (most major boiler manufacturers are already involved in fuel cell research). The UK should continue to adequately support research in these technologies and invest for the long term business benefits.

b) Medium Term

b. i) Significant increase in the use of alternative fuels – synthetic alcohol is a new and realistic concept that should be commercially available in the medium term and this or methanol will be the preferred base provided the cost can be made affordable.

b. ii) Improved battery technology will prompt significant increase in use of hybrid electric vehicles for urban use but this will depend upon more sustainable sources of electricity being available.

b. iii) Significant progress in the development of materials to facilitate the storage and transfer of H<sub>2</sub>.

b. iv) Further small efficiency gains in powertrain development and management, weight reduction, aerodynamics and recovery systems.

c) Long Term

c. i) Fuel cell development will continue with manufacturers keeping a commercial perspective and concentrating on mass market affordable solutions. Synthetic alcohols are likely to be the main energy source whilst research continues into the sustainable production of H<sub>2</sub> which should be commercially viable in 30 years.

**Question 2**

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

### Answer

- a) Confidence and good co-ordination between government and industry is crucial. Following significant funding by industry in providing an infrastructure to supply LPG, the concept has failed to realise expectations due to subsequent government fiscal policies and decisions.
- b) The effects of public expectations and spending power in influencing the car market should not be underestimated. Most of the improvements in fuel consumption achieved through technical development over the past 10 years have been subsumed by increases in weight as a result of the consumer requirement for vehicles to have more gadgets. Average fuel consumption for all road vehicles is not much better than it was a decade ago.

### Question 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?

### Answer

- a) We envisage vehicles and emissions evolving over the next 25 years as follows with net emissions increasing with market growth:-

|                        | <b>Technologies</b>   | <b>Fuels</b>  | <b>Emissions</b> |
|------------------------|---|---|------------------|
| <b><u>Now</u></b>      | 60% petrol 37% diesel<br>3% hybrid/electric vehicles  | 98% fossil<br>2% bio  | Baseline         |
| <b><u>5 Years</u></b>  | Majority diesel<br>8% hybrid/electric<br>Lighter vehicles<br>Improved powertrains<br>Regenerative braking<br>Energy recovery<br>Advanced lubrication<br>Fuel cell development | 90% fossil<br><br>10% bio<br>(alcohol/methanol)<br>{EU target 5.75% bio<br>by 2010} | Baseline + 10%   |
| <b><u>10 Years</u></b> | 85% diesel<br>Substantial advances in batteries<br>15% hybrid/electric<br>Secure hydrogen storage   | 70% fossil<br>30% bio<br>(synthetic alcohols)<br>{EU target 10% bio<br>by 2015}     | Baseline + 5%    |

|                        |   |  |                   |
|------------------------|---|--|-------------------|
| <b><u>25 Years</u></b> | 60% diesel<br>35% hybrid<br>5% Fuel cells | 10% fossil<br>90% bio<br>(alcohol based) | Baseline + 0%     |
|                        |   | H <sub>2</sub>                           | Reduced emissions |

b) **Critical Enablers**

- i) Sufficient financial support for continued research, particularly in synthetic alcohols and battery technology.
- ii) Development of materials to make storage and transportation of H<sub>2</sub> storage viable

c) **Possible Inhibitors**

- i) Fiscal policies that discourage long term investment in distribution infrastructure particularly for alternative fuels
- ii) Lack of confidence by investors of being “first to market” – perhaps this is an opportunity for government to help confidence and lead rather than insisting on industry commitment first.

d) **International Dimension**

We expect international markets to have differing characteristics, much as they are now. National energy sources and infrastructure will be major factors, i.e. Sweden already leads with hybrid electric vehicles and Brazil already leads in Biofuels. Buying patterns will also vary nationally due to differing social perceptions. In Germany it is the car that you drive that matters, in France it is who you are whereas in China it is how many gadgets the car has.

- e) The UK cannot afford to be complacent with our technical lead in any areas. The Chinese government with its 863 programme is investing huge sums in Electric vehicle and hybrid research. They also have the benefit of plentiful supplies of lithium to support this development and manufacture.

**Question 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 each?

### **Answer**

- a) We envisage a mix of technologies dominating all markets. The UK has a strong lead in some areas such as weight reduction and design primarily through the success of Formula 1 racing and whilst Government cannot support all areas of development it should prioritize and help protect the lead where we are strong.
- b) Synthetic fuels and advanced battery technologies have strong commercial drivers and the encouragement of research in these areas should be a priority.

### **Question 5**

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

### **Answer**

- a) The huge existing infrastructure for the manufacture, transport and sale of fossil fuels means that it will take a very strong market pull to change from liquid fuels to any other energy source for transport.
- b) In the long term any radical change may require enabling legislation as the technologies mature.

### **Question 6**

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

### **Answer**

- a) Driver education and behavior offers the most significant gains in the short term. One of the major sources of emissions is the stationary car with the engine running. Whilst difficult to quantify it is generally accepted that individual vehicle emissions savings of up to 6% are achievable if drivers can be persuaded to behave differently.
- b) Change in societal behavior in the way that journeys are planned is another opportunity for significant savings. This cultural change will require a concerted campaign of communication and education. The use of urban eco vehicles for short journeys should be encouraged through financial incentives – possibly nil VAT as in Netherlands.
- c) A scheme to encourage owners of older vehicles to get them off the road or modify them to use Biofuels could have a significant one-off impact. The existing fuels supply infrastructure could be used. The scheme would first need a detailed evidence based study to determine what actual emissions reductions could be

achieved and where the line should be drawn in the age of the car. Another consideration would be the social profile of those owning the older cars (poorer people rarely buy new cars), and the cost of converting older cars, currently estimated by some manufacturers at £1,400 per car for ethanol and less for biodiesel. These estimated costs do not compare favorably with examples from Brazil which leads the way in the use of Biofuels.

### **Question 7**

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

### **Answer**

See question 1

- a) Hybrids – small hybrids more efficient for urban use, plug-in hybrids give no overall emissions gain at present
- b) Alternative fuels
- c) Weight reduction
- d) Improved powertrains
- e) Regenerative braking
- f) Energy recovery systems
- g) In-car monitoring systems (i.e. tyre pressures, fuel usage)
- h) Continuous improvement in combustion
- i) Advanced lubrication
- j) Advanced battery technology (energy losses at start-up)
- k) Traffic management technology is available but not used to control lorry engines to suit their different weight/characteristics. Lorries are generally driven the same whether full or empty. Appropriate action/legislation here would have immediate gains. A 40 tonne lorry running at a steady 90km/hr on a level road needs approximately 100 kW power and most lorries of this size have typically 330kW engines.

### **Question 8**

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

## **Answer**

- a) Whilst the UK car market is the second largest in Europe, whatever we do to reduce emissions from road transport in the timescales discussed in this review, the effect on the overall atmospheric level of CO<sub>2</sub> will be minimal. Globally however, people do look to the UK for a lead in such matters and there is a strong moral imperative for us to do so. Whatever we do however, should be done in conjunction with or to stimulate, the EU, particularly in regulation (total EU market 7 times UK). The UK is well placed to have influence despite not leading in car manufacture, and we are still perceived as leaders in vehicle technology, punching well beyond our weight. Additionally our national emissions targets are far bolder than most other countries
- b) The facts are:-
- i) EC emissions target for cars is 140gm/km CO<sub>2</sub> by 2008 (and this will not be achieved) and 120 gm/km CO<sub>2</sub> by 2012.
  - ii) To stabilize atmospheric CO<sub>2</sub> pollution at 550 ppm will require vehicles to average 70 gm/km CO<sub>2</sub>
  - iii) To achieve atmospheric CO<sub>2</sub> pollution of 450 ppm vehicle average must reduce to 30 gm/km CO<sub>2</sub>
- c) The total UK contribution to global CO<sub>2</sub> emissions is relatively small with road transport contributing just 1.34%. Despite this we should take a lead and establish the moral high ground by setting an exemplar agenda for reduction, doing our best to bring the EU with us. Success in developing the enabling technologies will have enormous commercial trade-offs (China, with a 25% market growth still looks to the UK for a lead).

## **Question 9**

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

## **Answer**

- a) See 6. b). There are a variety of lower emissions vehicles available to the consumer now but some which are claimed to be so do not consider total emissions (plug-in hybrids). They are expensive (e.g Prius) and incentives for the purchase and use of these vehicles in urban areas would encourage their use. The “cool to be green” culture is a recent rising trend and such a move might widen the appeal. There should be a government programme to educate buyers so that they can make an informed choice of technology to match their driving patterns i.e. a hybrid for long distance motorway commuting is not necessarily the right choice. Manufacturers should be encouraged to try and offer the best solutions as well. It is encouraging to note that Toyota dealers are now quizzing potential customers on their driving profiles.

- b) Societal conscience of the environmental damage caused by emissions is growing as is awareness of the consequences. This is a slow process and it is a fact that Toyota sells 16 Landcruisers for every Prius sold. Government are attempting to inform the public of ways in which they can help and this campaign should also be aimed at drivers to try to curb two main areas of inefficiency - aggressive driving and single occupancy cars
- c) Government should encourage smoother modal interchanges through Local Government and through rail and bus franchises. Making it easier to travel by public transport would have an immediate and increasing effect.
- d) Government should provide incentives for the use of small new cars, particularly by young people (there are successful European examples of this).

### **Question 10**

How might consumer demand vary over time and what are the implications of this?

### **Answer**

- a) Car industry demand forecasts and cars per family have consistently been linked to economic growth and this is expected to continue to be the case. Demand is therefore expected to rise in line with GDP and population increase.
- b) The UK pool of older cars built to meet past emissions targets will increase until the effects of 2012 flexi fuel compliance and “stop at idle” legislation takes effect. Government needs to legislate to ensure the outcomes (removal/retrofit).
- c) There are global support implications in any increase in demand and the UK must ensure that it has the resources required to deliver the technologies. One potential problem area could be a huge increase in demand for blades for turbochargers for smaller turbocharged cars.

### **Question 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?

### **Answer**

- a) The UK should be followers in the application of legislation and leaders in its implementation.
- b) The UK is largely a service industry but we lead in technical innovation and we should aim to keep this lead through appropriate investment research.

- c) This is a global market and therefore joint research programmes between manufacturers and research centres in different countries is a sensible way forward. There are several such programmes involving UK research organisations and foreign manufacturers at present and Government should take a broad view when deciding where to offer support. The nature of the market dictates that the benefits of successful research will inevitably be shared.
- d) In both the development and uptake of vehicle technologies the UK should work with and influence the EU.

### **Question 12**

How strong are UK capabilities in the relevant product and technology areas, from the research base through to design, development and delivery?

### **Answer**

a)

|                                | Design | Development | Delivery |
|--------------------------------|--------|-------------|----------|
| Advanced Powertrains           | S      | S           | S        |
| Weight reduction               | S      | S           | S        |
| Materials                      | S      | S           | S        |
| Regenerative Braking           | S      | M           | M        |
| Energy Recovery                | S      | M           | M        |
| In-car Monitoring              | S      | S           | S        |
| Improved Combustion            | S      | S           | M        |
| Advanced Lubrication           | M      | M           | M        |
| Alternative Fuels              | S      | M           | W        |
| Advanced Battery Technology    | M      | W           | W        |
| Traffic Management Technology  | S      | S           | M        |
| Fuel Cell Technology           | M      | W           | W        |
| Materials for Hydrogen Storage | S      | M           | N/A      |

S = Strong    M = Medium    W = Weak    N/A = Not applicable

- b) The UK is strong globally and in the EU largely due to the success of Formula 1 racing and organisations such as MIRA. We have a good research base and sound partnerships between industry and universities and Government should continue its commitment to support these. Many of the future technical advances will come through incremental rather than revolutionary change and long term stability will be essential.

### **Question 13**

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

### **Answer**

- a) Public apathy (lack of awareness and lack of moral support).
- b) Government and/or EU bureaucracy associated with decision making.
- c) Inappropriate Government fiscal policies. The development of Biofuels could be stifled instantly by over-taxing – fuel producers could do the same by simply opening up the taps. There should be some built-in protection and UK fiscal policy should ideally be linked with EU fiscal policy so that volumes are more commercially sensible and address the actual market.
- d) Poor Government strategy. Long term joined –up strategy that is both technology and fiscally led is essential. A roller coaster of policies and strategies from central government invites a lack of confidence from investors and industry.
- e) Unrealistic legislation. Driven by a lack of understanding of just what technology can achieve and to what timescales.

#### **Question 14**

##### *Role of government*

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?

#### **Answer**

- a) Government should set the targets and leave industry to decide ways in which to achieve them. The LPG example illustrated what damage fiscal policy can do to investment and how industry can quickly become disaffected.
- b) Once targets are set Government should not intervene unless to incentivise and even then care must be taken not to upset the market. The market will then decide upon the appropriate rate of development.

#### **Question 15**

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

#### **Answer**

- a) See 2.a) and 14 a) for LPG example.
- b) Government taxation policy on company cars had an immediate beneficial effect and prompted a step change in the diesel/petrol car balance.
- c) An example of technology development being prompted by legislation is in France where 5% Biofuel was unilaterally added for “lubricity” through legislation aimed at placating farmers despite potential EU constraints.

- d) Similarly environmental legislation for cleaner cities in California successfully forced the pace of technology to reduce emissions.
- e) UK success in the areas listed at 12 a) have come about through long term support by Government for university research prompted by commercial drivers. These successes indicate that this is an appropriate role for Government and that enabling legislation is directed at areas that would yield the best emissions gains.

### **Question 16**

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

### **Answer**

- a) Government policy seems well considered and intended but despite that it has not resulted in a reduction of CO2 emissions. There is room for improvement in inter-department communication and integration.
- b) Long term strategy (beyond the life of several parliaments) is essential for stability in promoting infrastructure investment.
- c) Long term fiscal policy is critical. It should be focused on outcomes and non-political. The introduction of Congestion Charging in London is a good example although some of the proposed future legislation lacks evidence based justification.

### **Question 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?

### **Answer**

- a) EU bureaucracy and inactivity in some areas. The UK Government should work with the EU and influence decisions on all aspects of emissions reduction and attempt to speed up decision making, deliberation and evidence gathering process.
- b) Security of fuel supply. A relatively small number of countries and large organizations control the supply and infrastructure of fossil fuels. This is an ideal time for government to plan for more diverse sources of supply and to encourage new secure sources of alternative fuels to break the grip of the existing players.
- c) Security of national energy. Plans and implementation of a more sustainable balance of national energy sources should be very high on the Government agenda. The UK's sources of sustainable energy will not be cheap and decisions should not be wholly based on cost and should consider desired outcomes. Security of our

national energy supply will become even more crucial as the reserve of fossil fuels diminishes.

### **Question 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?

### **Answer**

- a) Government should try and ensure that when setting priorities they take into account what is best for UK industry
- b) Previous legislation to reduce emissions levels of company cars was successful. Ambitious but achievable maximum emissions levels for the whole vehicle fleet should be set and company cars used as the benchmark with appropriate tax incentives
- c) The use of hybrid vehicles should be encouraged. There is a good case for setting very low maximum emissions levels that attract significant national incentives (No VAT on purchase, no road tax etc). There are some local incentive schemes already operating but these vary and many do not take into account total emissions. The result is that some vehicles qualifying for incentives actually contribute more emissions.
- d) Downsizing of vehicles should be encouraged by Government. Financial penalties on the use of larger vehicles could help provide incentives for using those smaller and more efficient.

### **Question 19**

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

### **Answer**

- a) Properly considered legislation can and has been very effective in the past.
- b) Legislation should set the minimum targets to be achieved and optimization should be achieved by other means. Regulation has its place in forcing outcomes but it should not be linked to choices of technology and should allow a diversity of technology solutions.
- c) There is some evidence of the effects of fuel pricing in the USA and from the occasional leap in price in other countries. The results are patchy but they show that consumers just paid up. Fuel pricing should not be used to prompt lower emissions unless it is drastic.

- d) Some regulation is needed but it should be avoided where it does not add value.

### **Question 20**

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

### **Answer**

- a) There are several successful international examples of this:-  
Sweden – Hybrid electric  
Brazil – Biofuels  
France – Biodiesel  
California – Clean cities initiative  
An example of using the market and public domain to prompt the uptake of new technologies (but not necessarily low carbon vehicles) is the Euro NCAP for crash worthiness.
- b) Any future schemes to promote the development of low carbon technologies should be directed at those that are commercially viable. High visibility pilot and demonstration schemes should then be employed promote uptake.

### **Question 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?

### **Answer**

- a) Nurture new research into possible solutions using existing support frameworks and where possible tailor government procurement schemes to take advantage of any developing technologies at an early stage. This would provide more confidence for investors.
- b) Current Government assisted schemes for promoting UK business abroad and attracting inward investment have been quite successful. A similar scheme to specifically promote carbon vehicle technologies at the latter stages of development could be a good flagship for the industry.

### **Other Issues not Addressed**

- a) Typical potential for reductions :-
- |                              |    |
|------------------------------|----|
| Weight reduction             | 2% |
| Improved aerodynamics (cars) | 2% |

|  |            |
|--|------------|
| Improved aerodynamic (commercial vehicles)           | 10%        |
| Improved transmissions                               | 2%         |
| Cut idle at stop                                     | 10%        |
| More efficient systems (i.e. air con)                | 5%         |
| Energy recovery systems                              | 20%        |
| Driver education and behavior                        | 10%        |
| Car buyer education (selection/labeling)             | 10%        |
| <b>Total potential across fleets..... ..possibly</b> | <b>30%</b> |

ANNEX A

**EXPERTS MEETING 18/19 JULY 2007**  
**Grovefield House Hotel, Burnham Nr. Windsor**

**Vehicle and Fuel Technologies to Reduce Carbon Emissions from Cars**

The aim of this meeting is to provide a basis for evidence to the King Review of low carbon cars. This review follows on from the report by Sir Nicholas Stern and will build on both the work of the Energy White Paper and the TSB's Innovation Platform for Low Carbon Vehicles. It will examine transport-related technologies that can help bring a substantial reduction in carbon emissions over the next 25 years.

Delegates will be provided with a copy of the relevant questions posed by the review to set the scene.

**PROGRAMME**

**Day 1 - Wednesday 18 July**

|                    |   |
|--------------------|---|
| <b>0930 – 1000</b> | <b>Registration</b>   |
| <b>1000</b>        | <b>Welcome and introduction</b><br><i>Chairman Professor Ernest Shannon CBE</i>                         |
| <b>1020</b>        | <b>Emerging Technologies</b><br><i>Introduction by Professor Richard Folkson</i>                        |
| <b>1135</b>        | <b>Discussion</b>   |
| <b>1230</b>        | <b>Lunch</b>  |
| <b>1330</b>        | <b>UK Business Opportunities</b><br><i>Introductions by Duncan Bott and Dr Richard Pearson</i>          |
| <b>1415</b>        | <b>Discussion</b>   |
| <b>1515</b>        | <b>Coffee</b>   |
| <b>1530</b>        | <b>Non-Technical Considerations/Solutions</b><br><i>Introductions by John Cooper and Terry de Winne</i> |
| <b>1600</b>        | <b>Discussion</b>   |
| <b>1715</b>        | <b>Networking/Informal Discussions</b>  |
| <b>1900</b>        | <b>Informal Dinner</b>  |

**Day 2 – Thursday 19 July**

|                    |   |
|--------------------|---|
| <b>0900 – 1100</b> | <b>Separate Sessions – Emerging Technologies</b><br><i>Facilitator Professor Peter White</i><br><b>UK Business Opportunities</b><br><i>Facilitator Professor Derek Sheldon</i><br><b>Non Technical Considerations/Solutions</b><br><i>Facilitator Dr Malcolm Thomas</i> |
| <b>1100</b>        | <b>Coffee</b>   |
| <b>1115 – 1245</b> | <b>Feedback reports presented from sessions</b><br>30 minutes each  |
| <b>1245</b>        | <b>Lunch</b>  |
| <b>1345</b>        | <b>Discussion</b>   |
| <b>1515</b>        | <b>Coffee</b>   |
| <b>1540</b>        | <b>Chairman’s closing remarks</b>   |
| <b>1600</b>        | <b>Drinks Reception</b>   |

## **Experts Meeting 18/19 July 2007**

### **List of Delegates**

|                             |  |
|-----------------------------|--|
| <b>Dr Richard Bailey</b>    | <b>EPSRC</b>                                       |
| <b>Nick Blake</b>           | <b>DaimlerChrysler Marketing and Sales</b>         |
| <b>Duncan Bott</b>          | <b>Director, Fuel Cell Markets</b>                 |
| <b>Dr Gareth Buchanan</b>   | <b>EPSRC</b>                                       |
| <b>Maureen Carter</b>       | <b>IMEchE</b>                                      |
| <b>Prof Adrian Cole</b>     | <b>Technology Innovation Centre</b>                |
| <b>John Cooper</b>          | <b>General Manager, BP Global Fuels Technology</b> |
| <b>Ralph Claque</b>         | <b>Imperial Racing Green, Imperial College</b>     |
| <b>Geoff Davis</b>          | <b>Ricardo</b>                                     |
| <b>John Evans</b>           | <b>SMMT</b>  |
| <b>Prof Richard Folkson</b> | <b>IMEchE</b>                                      |
| <b>Steven Glaser</b>        | <b>Revolve</b>                                     |
| <b>Prof Gary Hawley</b>     | <b>Bath University</b>                             |
| <b>Dr Keith Holmes</b>      | <b>University of Bolton</b>                        |
| <b>Stewart Hildred</b>      | <b>MMA</b>   |
| <b>John Ling</b>            | <b>IMEchE</b>                                      |
| <b>John Lowe</b>            | <b>IMEchE</b>                                      |
| <b>Dr Richard Pearson</b>   | <b>Lotus Engineering</b>                           |
| <b>Dr Malcolm Thomas</b>    | <b>IMEchE</b>                                      |
| <b>Prof Ernest Shannon</b>  | <b>IMEchE (Chairman)</b>                           |
| <b>Prof Derek Sheldon</b>   | <b>University of East Anglia</b>                   |
| <b>Terry Spall</b>          | <b>IMEchE, Chairman, Automobile Division</b>       |
| <b>Bill Williams</b>        | <b>CEO, CEME</b>                                   |
| <b>Prof Peter White</b>     | <b>Assoc. Dean, Coventry University</b>            |
| <b>Terry de Winne</b>       | <b>CEO, Allied Biofuels Industries</b>             |