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The Knowledge Network

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PUBLIC CONSULTATION ON THE COMMUNICATION ON A SUSTAINABLE FUTURE FOR TRANSPORT

The Institution of Engineering and Technology (The IET) is one of the world's leading professional bodies for the engineering and technology community. The IET has more than 150,000 members in 127 countries and has offices in Europe, North America and Asia-Pacific. The Institution provides a global knowledge network to facilitate the exchange of knowledge and to promote the positive role of science, engineering and technology in the world.

This evidence has been prepared on behalf of the IET Trustees by the Transport Sector Panel. In compiling this submission account was taken of inputs from relevant IET Technical and Professional Networks and from individual professionals within the IET membership. Individual IET members are invited to submit input by means of publication of the consultation on the IET's website. Email alerts are sent to those who have previously registered an interest in policy.

The IET would be pleased to offer technical assistance to suggested follow up studies as indicated in our answers.

Yours sincerely,

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Introduction

Transport not only underpins our daily lives, but according to the Eddington Transport Study[1] it is also important in sustaining economic success in modern economies. However, transport accounts for about 20% of greenhouse gas emissions in the EU[2] and according to the Stern review[3] those emissions will impact on long-term economic growth by contributing to global climate change. In other words, the Eddington study suggests that traffic capacity needs to be increased while the Stern review encourages a decrease in traffic capacity. Although Stern does argue that countries can be rich and 'green' rather than poor and 'green' suggesting that if we get the balance right economies can still grow, but in a more sustainable way. It is important to point out that making transport and transport modes more sustainable and less contributing to Green House Gases is only one of the two twin-challenges for transport – the other being congestion across all modes and the more efficient and effective use of the Nations transport networks.

Reducing greenhouse gas emissions, whilst maintaining and developing our quality of life has to be the most important and greatest challenge, at all levels of transport infrastructure when devising a new transport strategy. In order to meet those two objectives, progress has to be made in implementing new technologies and innovative transport schemes, as well as encouraging a change in consumer behaviour and modal shift. If we act now the necessary cost of mitigating climate change and delivering a more sustainable society could cost within the region of 5% of Global GDP – however if we leave this too late and the effects of climate change have significantly 'kicked in' then the cost of mitigation and repair may be as high at 20% of GGDP.[3] This raises a massive challenge for policy makers and transport operators to move towards a strategy to meet these challenges now. The recession and the classic NIMBY responses making this a significant political issue.

Motorway toll

One way to implement both objectives is by creating road user charging schemes whilst increasing the provision of public transport. Within Europe several toll road schemes have been implemented, either for all vehicles or for classes of HGV's (for example in Austria, Czech Republic, France, Portugal, Italy and Germany). With the number of heavy good vehicle tolls on the rise, the EU Commission has to ensure that those schemes allow free movement of goods between countries without impinging on competitiveness of EU markets. Motorway toll schemes therefore need to be interoperable and a patch-work of different technologies and procedures needs to be avoided. Future development needs to be centrally coordinated in terms of technology architecture, standards, and specifications and thereby

[1] Sir Rod Eddington (2006) The Eddington Transport Study
http://www.dft.gov.uk/about/strategy/transportstrategy/eddingtonstudy/
[2] Eurostat data for 2007
[3] Sir Nicholas Stern (2006) Stern Review: The Economics of Climate Change
http://www.hm-treasury.gov.uk/sternreview_index.htm

maximising the interoperability between different networks and creating a single market for equipment and no impediment to travel and the exchange of goods over National Borders within the EU. Whilst the ITS Action Plan is a step into the right direction, the EU Commission has to ensure that measures will be taken up by Member States. The tolling schemes also need to be transparent so that members of the public understand the scheme and accept the principles under which it operates. To some extent this sort of message has been lost recently – particularly with the abject failure of the case for road user charging to be got across to the public prior to the Manchester TiF bid referendum.[4]

Intelligent transport systems (ITS)

Technology will play a crucial part in reducing the emissions from transport and optimising the use of transport networks to help manage with the demand for those networks. Intelligent transport systems for example can make transport cleaner, more efficient, safer and more secure as well as offering options for managing demand, through access control, advanced traffic management and road user charging. They can also play a role in making more sustainable modes, such as public transport, more attractive and relevant to travellers.

One seminal report which looked out 50 years to what science and technologies may emerge to support future transport systems, was the Foresight Intelligent Infrastructure study published by UK government in 2006 in which the IET was a significant stakeholder. The report[5] identified many of the emerging and future technologies and systems that would deliver the intelligence to optimise and radically improve the sustainability of transport. We believe that many of the recommendations from this report and subsequent responses to the report should be given consideration. We recognise that the DfT has adapted the scenarios developed in the Intelligent Infrastructure Study to test the delivery of DaSTS and we welcome this approach.

The average life-time of a vehicle is 14 years[6]. It is more difficult to retrofit vehicles with most safety systems – e.g. whilst it is easy to fit a satellite navigation system, Intelligent Speed Adaptation (ISA) could probably only be fitted to a vehicle on the production line. It will therefore take time for those technologies to be a common feature in cars. The lifetime of a vehicle can be slightly altered, for example the current scrappage scheme in the UK and Germany will do so and as might variations in the MOT test. Moreover the average life of infrastructure is 50 years – so for future transport systems it is important to get both the physical transport and intelligent transport infrastructure right for the future and 'future-proofed'.

[4] IET Membership News May 2009
[5] Blythe P.T. (2007) Findings from the Foresight Intelligent Infrastructure Study, Special Session on IIS, ITS Europe Conference, Aalborg, Denmark, June
[6] Commission for Integrated Transport, European comparison of taxes on car ownership and use index http://www.cfit.gov.uk/docs/2001/scot0122/scot0122/02.htm

ITS already makes significant contributions to transportation flow and road safety and should not be considered as future technologies - albeit that there is plenty of opportunity to do so - e.g. 'Co-operative Vehicle Highways Systems' and eSafety initiatives.

Road safety

ITS can help to reduce accidents by assisting the driver in difficult situations. The key challenge for system designers however is to develop a framework which allows the benefits of the systems to be calculated and the performance, in terms of accident reduction, to be optimised. The main difficulty in estimating the benefits of ITS is that they are not merely a technical system. They are designed to inform drivers and modify actions or behaviour. It is essential to examine the human factors impact of the system, for example in simulators and by using a range of established techniques, to determine how they will operate in the real world and hence, what the regulatory requirements should be. It is recognised that the e-safety programme in Europe has been a success in bringing new and effective safety systems to vehicles. What is required for the future is that similar research efforts are made to equip the infrastructure with safety systems which will contribute to protecting all vehicles and all users of the transport networks. This comment applies from a security point of view too.

Low carbon vehicles

It is clear that we are entering a period of change in road use. With ambitious targets for the reduction of greenhouse gas emissions from transport, it likely that the use of smaller, lighter vehicles will be encouraged and speed limits might be lowered to account for vehicle efficiencies. Those measures might have implications on road safety, which must not be overlooked.

Electrification of road transport has gained a lot of attention. The King review[7] proposed that if substantial progress is made in solving electric vehicle technology, an almost complete decarbonisation of road transport is possible by 2050. This depends however on the provision of carbon-neutral electricity through nuclear and renewable power generation as well as the development of Carbon Capture and Storage. Grid powered electric vehicles will only reduce carbon emissions if they draw their electricity from wholly or largely carbon free sources. Before around 2020 this can only be from renewables or nuclear as carbon capture and storage will not be deployed at scale before this time. A low-carbon transport strategy has therefore serious implications on the electricity demand and in particular clean electricity. The EU Commission needs to take this into account.

Multiple strategy approach to Carbon reduction

[7] Julia King (2008) The King Review of low-carbon cars

Because of the current and projected energy densities of electrical storage devices, including batteries and super capacitors, it can be deduced that a multi-strategy approach has to be adopted for the electrification of road transport. A and B Class City vehicles with a nominal 80-125mile range can using existing battery technology, and can achieve a good operating cycle within urban and extra-urban environments. Class C,D & E passenger vehicles currently employ hybridisation, in order to overcome range vs energy density/battery package issues. Light delivery vehicles • 3.5T, such as those manufactured by Smiths Electric vehicles have a maximum range of around 150mile.

Above 3.5T, the battery pack mass needed to provide extended range for commercial goods traffic is substantial, and has severe economic implications with respect to the purchase price of the vehicle. This potentially renders a pure EV heavy haulage solution unviable and unsustainable, especially when considering the amount of strategic metals required for the battery pack itself.

To increase range of C,D &E class electric vehicles, some manufactures are currently employing range extender devices using high efficiency engines, close coupled to a starter/alternator. Hydrogen fuel cells are also being trialled in a number of applications. Range extension could equally be applied to delivery and commercial vehicles • 3.5T.
For HGV transportation, a liquid or gaseous fuel is likely to be required for some considerable time. Bio-Di-Methyl-Ether (DME) could offer a viable alternative to Diesel. In comparison, DME has the potential of generating 95% lower carbon dioxide emissions, with the combustion process producing very low particulates and Nitrogen Oxides. Following trials since 2007, Volvo trucks have just announced[8] it intends to field test Bio-DME with 14 customers between 2010 and 2012. According to Volvo, Bio-DME has the potential of replacing over 50% of the current diesel used in heavy transport[9]. The fuel has the added benefit in requiring limited modifications to existing engine design, focusing mainly around the fuel injection system. This in turn means that high capital expenditure is deferred by manufacturers and the technology could act as a potential accelerate to reducing carbon emissions in the heavy haulage fleet. China has a DME network in place in some cities and uses the fuel in modified public service vehicles. China uses non-Bio DME from the gasification of coal. Equally Bio-DME can act as a fuel for range extenders in passenger vehicles, a Diesel replacement in rail transport or as a kerosene alternative in fixed gas turbine applications.

EV Charging Infrastructure

So far, no action has been undertaken to standardise the vehicle charging plug and socket and it has been left to manufacturers and electricity companies to chose their own. The IET

[8] Volvo press release 18.09.09 Volvo in uniqueBio-DME project
[9] EUCAR/CONCAWE/JRC 2005,European commission, Volvo

believes that a standard plug should be advocated for all electric vehicles across Europe to allow the construction of universal charging points. Having different plugs might hinder the introduction of electric vehicles and will cause further expense when designing charging stations. The IET supports the recent announcement of funding from ETI to ensure a network of interoperable charging points around the UK.

Vehicle Battery standards

Currently uniform test specifications do not exist for traction batteries used in motor vehicles within the U.K. Test specifications are in place in both Japan and the US. One of the main issues is that the majority of cells are derived from commercially available units which are used in static applications. The Automotive environment is very exacting, with respect to performance and package / weight constraints. Vehicle batteries also have a finite useful life which is dependant on a number of factors, but are particularly influenced by the number of total full depth of discharge cycles, overcharging, over-discharging and over-temperature. Although generic 'common battery packs' for passenger vehicles may be some while off, the IET feels it would be advantageous to formulate industry test specifications for these components.

Adapting transport infrastructure to climate change

As well as working to mitigate climate change, the EU Commission needs to start encouraging EU Member States to adapt their national infrastructure to the impacts of climate change. Since transport becomes more and more interlinked with electricity supply and ICT, those networks need to be treated as one system and measures have to be in place to make them resistant to extreme weather conditions. Built in redundancy and future-proofing capacity in new transport schemes are key.

Significant work is on-going to try to understand the long-term effects of climate change on infrastructure (i.e dryer summers and wetter winters and more extreme weather) – work in groundbreaking projects such as the BIONICS project at Newcastle University is exploring how vegetation may change and thus effect the strength and integrity of future road and rail embankments. More investment is needed into research to find practical solutions to these future problems.

Multi-modal trips

The EU Commission needs to encourage seamless multi-modal journeys. Some journeys, particularly when they are started in rural areas or areas with few public transport links will always be done by car. The IET believes however, multi-modal journeys have to be encouraged through good information and travel planners as well as through integrating the road network with other modes of transport through park and ride facilities. Although

significant research and development has been funded in this area – there is more to be done to deliver, seamless, personalised and effective information to travellers.

Eurocontrol for railways

The IET believes that it is vital for the European rail services to become more efficient, integrated and reliable. Technical standards for Interoperability have to be implemented at a faster rate than has been the case to date through the European Commission's Rail Packages in order to make rail services across country boundaries more economically viable. The European Commission, in association with its standards body, the European Railways Agency, should accelerate their work towards implementing a "Eurocontrol" for railways with the priorities of overseeing the pan-European processes for safety, capacity, efficiency, environment and security required to deliver an integrated and interoperable railway system.